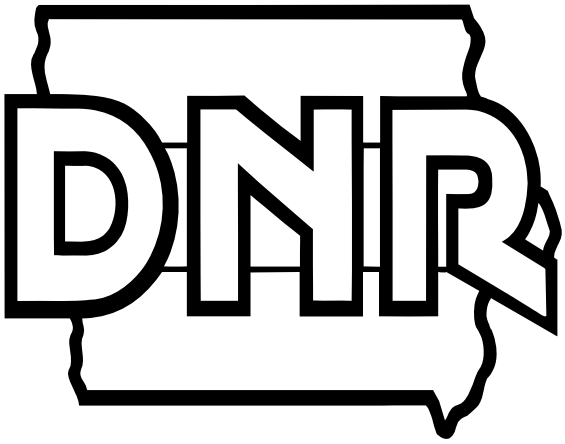
Minor Source Emission Inventory (MSEI) Instructions

(Revised December 2008)



Iowa DNR - Air Quality Bureau

www.iowacleanair.com

Return the MSEI and relevant Material Safety Data Sheets by May 15 to:

Emissions Inventory
Air Quality Bureau, DNR
7900 Hickman Rd., Suite 1
Urbandale, IA 50322

Table of Contents

DNR Air Quality Contacts

Emission Inventory Questions
Nick Page 515-281-8500
nick.page@dnr.iowa.gov

Karrie Darnell 515-281-4678
karrie.darnell@dnr.iowa.gov

Amanda Hostetler 515-281-5774
amanda.hostetler@dnr.iowa.gov

Greenhouse Gas Questions
Marnie Stein 515-281-8468
marnie.stein@dnr.iowa.gov

Iowa Waste Reduction Center
Iowa Air Emissions Assistance Program (IAEAP)
University of Northern Iowa
1-800-422-3109 or
319-273-8905, Fax: 319-268-3733
http://www.iwrc.org/IAEAP/

Air Bureau Records Center
515-281-6202

Air Bureau Numbers
515-242-5094 (fax)
515-242-5100 (phone)

Asbestos Program
Marion Burnside 515-281-8443
marion.burnside@dnr.iowa.gov

Polk County Air Quality
515-283-3351 (phone)
515-875-5599 (fax)
http://www.airquality.co.polk.ia.us/staff.aspx

Compliance Section
Dennis Thielen 515-281-4899
dennis.thielen@dnr.iowa.gov

Construction Permit Questions
1-877-AIR-IOWA

Construction Permit Forms
1-877-AIR-IOWA
www.iowacleanair.com

Hazardous Air Pollutants, MACTs
Diane Brockshus 515-281-4801
diane.brockshus@dnr.iowa.gov

Media Requests
Mindy Kralicek 515-281-7832
mindy.kralicek@dnr.iowa.gov

SPARS
SPARS Helpdesk
www.iowacleanair.com

Stack Test Information
Mark Stone 515-242-6001

Title V Operating Permits
Chris Kjellmark 515-281-7826

Linn County Air Quality
319-892-6000 (phone)
319-892-6099 (fax)
http://www.linncleanair.org/

On-line Resources

DNR Air Quality Bureau
www.iowacleanair.com

DNR MSEI Forms
www.iowacleanair.com
Click on “Emissions Inventory” then on “Minor Sources” then on “Forms and Instructions.”

EPA Emission Factors
To access AP-42 and WebFIRE emission factors go to:
www.epa.gov/ttn/chief/efpac/index.html

Latitude and Longitude
www.topozone.com
www.google-earth-soft.info
www.esri.com

SIC Codes
www.osha.gov/pls/imis/sicsearch.html

SCC Codes
www.iowacleanair.com
Click on “Emissions Inventory” and scroll down to “Frequently Used Emissions Inventory Resources.” Click on “Source Classification Code (SCC) List.” Ethanol and Biodiesel plants should click on “Ethanol and Biodiesel Source Classification Code (SCC) List.”

Calculation Spreadsheet and Tools
To access calculation spreadsheets for painting operations, haul roads, asphalt, concrete and limestone processes go to:
www.iowacleanair.com
Click on “Emissions Inventory” then the appropriate spreadsheet located under “Frequently Used Emissions Inventory Resources.”

SPARS Web
Download SPARS user’s guide at
www.iowacleanair.com
Click on “SPARS”

Iowa Air Emissions Assistance Program (IAEAP)
http://www.iwrc.org/IAEAP/

Iowa Administrative Code (IAC)
http://www.legis.state.ia.us/IAC.html
See section 567, Chapters 20-34

General Instructions/Purpose

Introduction

This packet contains forms, instructions, and information needed to complete a ***minor source emissions inventory***. Submitting a complete inventory is required by 21.1(3) of the Iowa Administrative Code. Some companies may be unfamiliar with air quality terms, therefore a glossary is included in Appendix A. Terms included in the glossary are bolded and italicized. In addition, general air program definitions are found in 567 Iowa Administrative Code (IAC) 20.2. The IAC is available on the internet at http://www.legis.state.ia.us/IAC.html or you may contact the DNR for a paper copy.

The deadline for submitting a completed Minor Source Emissions Inventory is May 15.

Failure to meet the May 15th deadline will be strictly enforced. If you need assistance completing the inventory please contact DNR or IAEAP staff (see details below).

Minor Source Ethanol Facilities must submit a Greenhouse Gas Emissions Inventory by March 31.

Getting Help Completing Your Inventory

The DNR assists small businesses by funding the Iowa Air Emissions Assistance Program (IAEAP) at the University of Northern Iowa. The IAEAP will provide free assistance in completing emission inventories for facilities with **less than 100 employees**. You may contact the IAEAP toll free at 1-800-422-3109. **You must contact IAEAP before May 15th to be eligible for their assistance.**

The DNR will provide assistance to facilities upon request. Emission inventory staff will be available for questions over the phone and on-site assistance for any facility as time permits. If your facility would like assistance, please contact one of the emission inventory staff on the air quality contacts list on page 3 of this booklet.

Please contact the DNR or IAEAP with any questions before submitting the MSEI. If the MSEI is incomplete or incorrect calculations were used, the DNR will require additional submittals until the MSEI is complete and correct.

Emissions Reporting

All seven ***Criteria Pollutants*** *(including* ***PM2.5****)*, 187 ***Hazardous Air Pollutants*** (HAPs), and ***Ammonia*** are required to be reported in the MSEI. A listing of all reportable pollutants can be found in Appendix B. Please consult this list if unsure if a pollutant is reportable.

Emission estimates should be evaluated for all emission sources at your facility including ***fugitive emissions***. However, it may not be necessary to report all of the sources or pollutants in the MSEI. Please refer to page 7 for a list of sources which are considered exempt from the minor source emissions inventory.

Both potential and actual emissions must be reported for each emission unit. There are separate forms for reporting potential and actual emissions. ***Emissions units*** may be grouped for reporting potential and actual emissions *only* if the emission units are identical and they exhaust to the same emission point.

Ethanol Facilities

Iowa Code 455B.152, passed by the 2007 Iowa General Assembly, requires the DNR to establish a method for collecting data from Iowa's producers of ***greenhouse gas*** emissions (GHGs).

By March 31st, all Ethanol facilities are required to complete and submit a reporting spreadsheet that auto-calculates direct GHG emissions from fossil fuel combustion and fermentation.

Facilities may download the spreadsheet from http://www.iowadnr.gov/air/prof/ghg/ghg.html.

There are four tabs on the spreadsheet. The tabs and instructions are:

- Emissions from Throughputs tab:
  Fill in the green cells with your facility information and the yellow cells with your 2008 throughputs. *Note: this tab is formatted to print out on legal sized paper.*
- Emissions from Fermentation tab:
  Fill in the green cells with your facility information and the yellow cells with your 2008 throughputs.
- Emissions from CO2 Stack Test Data tab:
  Fill in the green cells with your facility information and yellow cells with any stack test data.
- Emissions from CEM Data tab:
  This tab needs to be completed by facilities with continuous emissions monitoring equipment. Fill in the green cells with your facility information and yellow cells with your 2008 CEM data.

After completion, the spreadsheet can be submitted by:

- Attaching electronically to Form INV-1 of SPARS Minor Source Inventory.
- Print out and attach to paper Minor Source Inventory.
- For Minor Source ethanol facilities that are not required to complete a 2008 Minor Source Emissions Inventory, print out the spreadsheet and mail.

All Greenhouse Gas Emission spreadsheets must be submitted by March 31, 2009.

The DNR considers the following items exempt from MSEI reporting at this time:

1. **Any pollutant with potential emissions less than 0.01 tons per year;**

2. **If all pollutants for an emission unit have potential emissions less than 0.01 tons per year, then the emission unit can be excluded from the inventory;**

3. **Fuel-burning equipment for indirect heating and reheating furnaces using natural or liquefied petroleum gas with a capacity of less than 10 Million Btu per hour input per combustion unit;**

4. **Fuel-burning equipment for indirect heating with a capacity less than 1 million Btu per hour input per combustion unit when burning coal, untreated wood, or fuel oil;**

5. **Direct-fired equipment burning natural gas, propane, or liquefied propane with a capacity of less than 10 million Btu per hour input, and direct-fired equipment burning fuel oil with a capacity of less than 1 million Btu per hour input, with emissions that are attributable only to the products of combustion;**

6. **An internal combustion engine with a brake horsepower rating of less than 400;**

7. **Any generator that is operated less than 2 hours per week;**

8. **Storage tanks with a capacity of less than 19,812 gallons and an annual throughput less than 200,000 gallons;**

9. **Any container, storage tank, or vessel that contains a fluid having a *maximum true vapor pressure* of less than 0.75 psia;**

10. **Nonproduction maintenance activities, which may include brazing, soldering, or welding equipment, and surface coating operations using only hand-held aerosol spray cans;**

11. ***Manually operated equipment* (see definition in Appendix A on page 65) used for buffing, polishing, carving, cutting, drilling, machining, routing, sanding, sawing, scarfing, surface grinding, or turning;**

12. **Indoor-vented powder coating operations with filters or powder recovery systems;**

13. **Parking lots and employee roads used to get to and from work. However, unpaved and paved roads used to haul material and/or product on a regular basis must be included.**

NOTE: Indoor-vented sources MUST be included in the inventory if they do not qualify for any other exemption.

Small Unit Exemptions:

Emission units that have a small unit exemption justification document required by 567 IAC 22.1(2)"w" *do not* have to be included in the minor source emissions inventory but the exemption justification document must be attached. Such exemption justification documents shall include the following:

1. **A narrative description of how the emissions from the emission unit were determined and maintained at or below the annual small unit exemption levels.**
2. **If used, a description of air pollution control equipment associated with the emission unit and a statement that the emission unit will not be operated without the control equipment operating.**
3. **If control equipment is used, the applicant shall maintain a copy of any report of manufacturer's testing results of any emissions test, if available. The Iowa DNR may require a test if it believes that a test is necessary for the exemption claim.**
4. **A description of all production limits required for the emission unit to comply with the exemption levels.**
5. **Detailed calculations of emissions reflecting the use of any air pollution control devices or production or throughput limitations, or both, for the applicable emission unit.**
6. **Records of actual operation that demonstrate that the annual emissions from the emission unit were maintained below the exemption levels.**
7. **Facilities designated as major sources with respect to rules 22.4(455B) and 22.101(455B), or subject to any applicable federal requirements, shall retain all records demonstrating compliance with the exemption justification document for five years. The record retention requirements supersede any retention conditions of an individual exemption.**
8. **A certification from the responsible official that the emission unit has complied with the exemption levels specified in 22.1(2)"w"(1).**

Potential to Emit

Potential to Emit (PTE) is calculated assuming that your equipment is running at maximum capacity while operating at the maximum hours of operation under its physical and operational design. Usually, maximum hours of operation are **8,760** hours per year unless limitations on hours of operation have been incorporated within a ***construction permit*** or an enforcement order for that equipment. ***Bottlenecks*** in a production line do not constitute a limitation on production unless those bottlenecks are included as an operating condition in a ***federally enforceable*** permit. Therefore, in most cases bottlenecks cannot be used as a basis for limiting emission unit capacity below the manufacturer's rated capacity. Only federally enforceable limitations on raw materials, fuels, capacity or hours of operation can be used to limit potential emissions. Call DNR staff for further clarification.

Actual Emissions

Actual emissions are the actual rate of pollutant emissions from an emission unit calculated using the emission unit's actual operating hours, production rates, and quantities of materials processed, stored, or combusted for the calendar year.

Emissions Estimation Methods

Emissions must be based on the best possible method. Do not use a less preferable method if a more preferable one is available. Using a less preferable method or unacceptable methods could result in your inventory being returned for revisions.

Regardless of the method used to calculate emissions, supporting documentation must be included with the MSEI submittal. This documentation must be sufficient in order to allow DNR to evaluate the emissions calculations.

Methods of Calculating Emissions *(in order of preference)*

1. Continuous emissions monitoring
2. Valid stack sampling which represents maximum operating conditions
3. Material balance
4. EPA-approved emission factors
5. Vendor supplied emission factors
6. Engineering estimates based on best available process operating data

• ***Continuous Emissions Monitoring*** systems measure pollutant concentrations in the exhaust stack 24 hours a day. There is no better method for determining emissions, however, these systems are very expensive and most facilities do not use them.

• A ***Stack Test*** measures the concentration of pollutants in the exhaust stack during the test period. Test periods can vary from a couple of hours to an entire day. Stack test data can provide an accurate emission rate for many different processes and pollutants.

• ***Material Balance*** can only be used on specific types of emission units. It is most commonly used for surface coating operations (paint booths, dip tanks, etc.). Information must first be gathered on process rates, material used, and material properties (usually from ***material safety data sheets*** (MSDS)). By combining this information with the knowledge of the process, an emission estimation can be made.

• ***Emission Factors*** are the basis for many calculations. Emission factors represent industry averages and show the relationship between emissions and a measure of production. You will need to obtain access to EPA's emission factors. The DNR will not provide you with the entire volume of emission factors directly; however, if you encounter problems finding emission factors for a source you may contact DNR for assistance. When using EPA or other emission factors, you must use the most recently approved version. Sources of emission factors are listed on page 10.

• ***Vendor Supplied Factors*** may be used if a more preferred method is not available. Many manufacturers of industrial equipment provide emission information for their products. This data may be used to calculate emissions only if the manufacturer's data is based on approved stack testing and no significant changes have been made to the emission unit. Supporting documentation must be included in the submittal if vendor supplied factors are used to calculate emissions.

• ***Engineering Estimation*** is allowed if a more preferred method is not available. The DNR realizes some processes exist that have no published guidance regarding the estimation of emissions. In these cases, the estimation must be the best possible assessment given the amount of data available. Supporting documentation must be submitted to show how the estimation was made.

Sources of Emission Factors

AP-42 COMPILATION OF AIR POLLUTANT EMISSION FACTORS is the recommended source of air pollutant emission factors, with descriptions of activities producing criteria and hazardous air pollutant emissions. AP-42 can be accessed from the CHIEF Internet site http://www.epa.gov/ttn/chief/ap42/.

WebFIRE is the internet version of FIRE and it has replaced the software application, FIRE version 6.25, and the Microsoft Access version of the database. An internet version of FIRE allows more frequent updates and easier access. Log on to http://cfpub.epa.gov/oarweb/index.cfm?action=fire.main to access WebFIRE. A list of frequently asked questions at the above link describes in more detail the functions of WebFIRE and where the emissions factors come from.

TANKS The Tanks 4.09D software estimates VOC's and hazardous air pollutants from vertical and horizontal fixed-roof tanks, internal and external floating-roof tanks, domed external floating roof tanks and underground storage tanks. It is based on the emissions estimation procedures presented in Section 7.1 of AP-42, 5th Edition. TANKS can be downloaded from the CHIEF web site http://www.epa.gov/ttn/chief/software/tanks/.

Tips to Avoid Common Mistakes when filling out your MSEI

1. Do not use your last Emission Inventory Instruction Book. It is out-of-date.

2. Many HAP's are also Volatile Organic Compounds (VOC's). List such pollutants as both a HAP and a VOC on Forms INV-3 and INV-4.

3. Only one Form INV-1 is required for a facility's MSEI submittal.

4. Remember to submit Forms INV-2 for all points, and submit Forms INV-3 and INV-4 for all processes.

5. Do not use a generic calculation page. When reviewing a submitted MSEI, the DNR needs to be able to reproduce all of your calculations.

6. If higher control efficiencies are reported than what is given in the Control Efficiency Guidance Document (Appendix C), these control efficiencies must be verified by test data from an EPA approved method.

7. Do not use outdated or old emission factors. The most up-to-date emission factors must be used for accurate emissions calculations. If you are copying Forms INV-3 and INV-4 from a previous inventory, double-check all emission factors as they may have changed during the past three years.

8. Remember to add $PM_{2.5}$ and Ammonia emissions to each INV-3 and INV-4. If using SPARS, they will not copy from a previous inventory.

9. Use correct units of measure for emission factors and design rates. Units of measure need to correspond between emission factors and the emission unit design rate.

10. Remember to fill out the operating schedule on Form INV-4.

11. Remember to fill out all construction dates on Form INV-3.

12. Construction permit limits, if applicable, should be used to calculate potential to emit.

13. Do not report total particulate matter - report only PM_{10} (particulate matter 10 microns or less in diameter) and $PM_{2.5}$ (particulate matter 2.5 microns or less in diameter).

14. Remember to include the small unit exemption justification document for all emission units which meet 567 IAC 22.1(2)"w." An INV-2, INV-3, and INV-4 form **does not** need to be filled out for emission units which meet small unit exemption status. Please see page 8 for a complete list of what needs to be included in a small unit exemption justification document.

Returning the MSEI

Submittal Deadline: May 15

A completed Minor Source Emission Inventory can be returned to the DNR as a paper copy or electronically by using the State Permitting and Air Reporting System (SPARS).

Keep a Copy – Keep a complete copy of your completed MSEI. DNR staff review all submissions, and frequently have questions regarding an inventory. A copy will also be useful to you when completing future MSEI's. Only mail one copy.

The emission inventory data must be submitted on forms provided by DNR. Forms can be completed using a paper copy or an electronic version.

A signature is not required for the minor source emissions inventory.

Paper Copy

The forms can be obtained at http://www.iowadnr.gov/air/prof/emiss/eform.html. If you do not have web access, you may contact the DNR to obtain paper forms. All information must be typed due to the volume of MSEI's the DNR receives. Other formats are not accepted.

SPARS

An alternative is to submit your MSEI electronically using a data entry system developed by DNR called SPARS, i.e. State Permitting and Air Reporting System. This system will allow you to create your new MSEI by copying your most recent emissions inventory. This copy feature for facilities with a previous inventory will save considerable data entry time. If your facility has never submitted an emissions inventory you will need to create the inventory from scratch. This will include data entering your facility information and equipment in SPARS as well as data entering emissions information for the appropriate emissions year. Additionally, using the web-enabled version of SPARS will allow DNR to update your software automatically instead of you downloading updates. If you have a stand-alone version of SPARS already on your computer, you should switch to the web-enabled version as **disk submittals will not be accepted**. The web-enabled system requires a PC with Windows 2000, NT, or XP versions and currently will not work with some Internet Service Providers, such as those using dial-up access.

System Administrator and Responsible Official passwords are required to access the system. You may go to http://www.iowadnr.gov/air/prof/SPARS/info.html to get instructions on how to get started and request your passwords.

Training in SPARS will help you use the system accurately and efficiently. You may arrange for free training by contacting Emission Inventory staff on page 3 of this booklet. A postcard will be mailed out later this winter informing facilities of upcoming SPARS training dates which will be conducted by IDNR staff. Please visit our SPARS website at http://www.iowadnr.gov/air/prof/SPARS/ for more technical information regarding SPARS or contact the SPARS helpdesk by e-mailing to SPARShelpdesk@dnr.iowa.gov or by calling 515-242-5100.

Confidentiality

The DNR recognizes the need to keep certain information about facility operation confidential. If you have any concerns about keeping submitted information confidential, contact Kelli Book, DNR legal staff, with questions regarding confidentiality at 515-281-8563.

MSDS

If using mass balance to estimate emissions, then copies of all material safety data sheets for materials used at each emission unit during the previous calendar year must be included with the MSEI submittal. Also include the amount of each material used for each product. MSDS's are needed for a complete review of the submitted MSEI.

Minor Source Emission Inventory Form Instructions

FORM INSTRUCTIONS: Form INV-1

Only one Form INV-1 (Facility Identification) is required per facility

1) Type of Submittal: Check the box appropriate for your current submittal. For all facilities your first submittal will be an "Initial" submittal. If additional information is requested by DNR, that submittal must include another Form INV -1 identifying your facility. The box on Form INV-1 for Supplemental Information should be checked in this circumstance.

2) Facility Number: The facility number is a unique number assigned to your plant. It can be found on the mailing you received regarding the emissions inventory reporting requirement. This number has the following format: ##-##-###. If you misplaced your facility number, please contact Karrie Darnell at (515) 281-4678.

3) Company/Facility Name: Enter the official company name and/or plant designation for the facility submitting the MSEI. This official facility name must be entered the same on every form submitted.

4) Emission Year: Enter the calendar year for which you are calculating ACTUAL emissions from this emission unit. Usually this will be the previous year.

5) Facility Street Address, 6) City, and 7) ZIP Code: The street address is the physical location of the facility not the address of a corporate office where the MSEI may have been filled out.

8) Facility Contact Person: The facility contact is the person most familiar with the operations of the plant and who should answer any questions regarding the MSEI submitted for this particular facility.

9a) Facility Contact Phone Number: The telephone number where the facility contact person can be reached directly.

9b) Facility Contact E-mail Address: The e-mail address where the facility contact person can be reached directly.

10) Mailing Street/P.O. Address, 11) City, 12) State, and 13) ZIP Code: The mailing address should be entered if the mailing address of the facility is different from the street address.

14) Parent Company/Owner Name: Complete this block with the name of the parent company or owner if another company at a different location owns your company wholly or in part. If there is no parent company at a different location, please leave this block blank.

15) Parent Company/Owner Mailing Address: Enter the mailing address of the parent company or owner if one is identified in Box 14.

16) City, 17) State, 18) Zip Code: Enter the city, state, and zip code of the parent company or owner identified in Box 14.

19) Parent Company Contact/Agent: Enter the name of a person to contact at the parent company or the registered agent for the company.

20) Parent Company Contact Phone Number: Enter the telephone number of the contact, if any is identified in Box 19.

Principal Activity - Process and Products

21) Standard Industrial Classification (SIC): Enter the SIC code number that most appropriately describes the type of activity occurring at this facility. The SIC is a four digit number used to identify industries. The first two digits are the "major group" of a facility. For example, major group 20 is "Food and Kindred Products." The last two digits of the SIC code identify the specific type of facility. Food products that have 43 as the last two digits, for instance, make Cereal Breakfast Foods (SIC code 2043). The Standard Industrial Classification Manual contains all SIC codes and may be available at your local library. SIC codes can also be found at http://www.osha.gov/pls/imis/sicsearch.html.

There are times when sources having different major SIC codes may be part of the same facility. *In that case, use the SIC code that is the main one for your operations.* For example, a facility that both makes and prints on cardboard boxes has two SIC codes. It's primary SIC code is 2653, Corrugated and Solid Fiber Boxes. Since the company does some of its own printing on site, its secondary SIC code is 2754, Commercial Printing, Gravure. List 2653 as the primary SIC code and list 2754 in Box 23.

22) Activity Description: Enter a written description of the activity occurring at this facility.

23) Secondary Activities: Enter the SIC codes and written descriptions of any secondary activities that may be occurring at the facility (see discussion of secondary activities in #21 above).

24) Plant Location: Enter the plant's latitude/longitude in degrees to six decimal places. This information may be obtained from your property deed or county plat maps available at your local library or county recorder. If not available call the DNR's Nick Page at (515) 281-8500 for help. For help converting degrees, minutes and seconds to a decimal, refer to Topozone at www.topozone.com or Arc GIS Explorer at www.esri.com. ***Note: if you are using SPARS and the latitude/longitude has already been pre-filled by DNR, please do not change the coordinates.***

Form Instructions: Form INV-2

Duplicate if needed and return a completed Form INV-2 (Emission Point Description) for each emission point at your facility.

If the emission point in question has a construction permit, most of the information asked for below can be found in the permit.

1) Company/Facility Name: Enter the company name as it appears on Form INV-1.

1a) Form INV-2 - page___of___: Some companies may need to use multiple Forms INV-2. This box identifies each page of the total number of Form INV-2 included.

2) Emission Point Number: Enter the identification number your company assigns to this particular stack/vent. Please use the same numbering scheme as any previous MSEI and/or construction permits, and use it consistently throughout the application. The ***emission point*** number identifies the point where emissions vent to the atmosphere. Emission points can include stacks, horizontal vents, building ventilation vents, and fugitive sources such as material storage piles, rock crushers, and volatile liquid storage tanks. Each fugitive emission source should be assigned a separate emission point number.

3) Emission Point Description: Provide a brief description of the emission point, i.e. boiler #1 & 2 stack, paint booth #7 wall vent, etc.

4) Bypass Stack? If this stack is a bypass stack, check yes. If Yes, for which stacks? List emission point numbers.

5) Emission Point Type: Check the box that best describes the emission point. All indoor-vented sources should be indicated as "Other," and specified as vents indoors.

6) Stack Shape and Dimensions: Self-explanatory

7) Stack Height Above Ground: Enter the height from the ground to the top of the stack.

8) Rain Cap, Other Obstruction, or a Horizontal Discharge: Check the appropriate box. If YES, specify the type of obstruction, i.e. elbow, rain cap, or horizontal discharge.

9) Composition Of Exhaust Stream: Enter the flow rate and temperature of the exhaust stream. The flow rate can be obtained from the rating on the exhaust fan. Be sure to enter the values in the same units of measure as already listed on Form INV-2.

10) Bypass Stacks: If there are any bypass stacks or parallel stacks through which air contaminants from this emission point may be emitted, enter the bypass stack emission point number and description.

11) List of Emission Units Venting Through This Emission Point: List the emission unit numbers for all emission units venting through this emission point.

Form Instructions: INV-3

Duplicate if needed and return a completed Form INV-3 (Emission Unit Description - Potential Emissions) for each emission unit at your facility. If an emission unit has multiple processes, complete a separate INV-3 for each process.

An ***emission unit*** is the equipment that generates air pollution emissions. An example is a boiler combusting fuel oil. Fuel oil is the ***raw material*** and the combustion of the fuel oil is the process. For emission units with two processes - such as a grain dryer - do the following:

Process 1: natural gas combustion – SO_2, NO_x, CO, VOC, etc. emissions
Process 2: grain drying - produces particulate emissions

Two forms must be completed, one for each process. The emission point and emission unit numbers will remain the same on each form. However, the SCC number may be different for each process. List the worst-case pollutant for the emission unit on the form for the associated process. To add an SCC number when completing an inventory in SPARS, right click on the SCC number drop down list and select "add." A new SCC number and description of process entry field will be ready to be data entered.

Potential emissions must be calculated based upon the maximum design rate of the emission unit and 8,760 hours of operation per year. The only exception to this is if this emission unit has federally enforceable limits on either process rate or hours of operation by a permit or order.

Even if similar raw materials can be used at the emission unit, such as a variety of solvents, fill out only one form. In this case, calculation of potential emissions must be done with "worst case" values for each pollutant. For example, Solvent A contains 3 lb/gal toluene and 2 lb/gal benzene, while Solvent B contains 1 lb/gal toluene and 4 lb/gal benzene. Calculate emissions based on the Solvent A toluene value of 3 lb/gal and the Solvent B benzene value of 4 lb/gal.

1) Company/Facility Name: Enter the company name as it appears on Form INV-1.

1a) Form INV-3 page ___of___: A **separate Form INV-3** must be completed for each process at your plant. An emission unit is the equipment that produces the air pollution emissions, e.g. boiler, paint booth, generators, welders, haul roads, etc. Since many companies will need to use multiple Forms INV-3, this box identifies each page of the total number of Form INV-3 that has been included.

2) Emission Point Number: Enter the emission point number that your company assigns to the stack or vent serving this emission unit. This must be the same numbering scheme as used on Form INV-2. Please use the same numbering scheme as any previous MSEI that you completed and/or construction permits. Use this consistent numbering throughout the application.

Emission Unit (Process) Identification & Description

3) Emission Unit Number: Enter the identification number that your company assigns to this emission unit. This must be the same numbering scheme as used on Form INV-2 and throughout the application. Naming and numbering of emission points and emission units should be consistent with any previous MSEI completed and with any construction permits. Please request assistance for help in resolving any numbering or naming inconsistencies. Keep in mind that an emission unit is the equipment, e.g. boiler, paint booth, which generates the air pollution emissions and may have multiple processes.

4) SCC Number: Enter the ***Source Classification Code*** Number (SCC) that identifies the type of process or activity occurring at this emission unit. The SCC number corresponds to the Description of Process (Box 5) and specific "emission factor units"(lb/ton, lb/gal, etc.). The SCC number can be located in EPA documents such as AP-42 and WebFIRE. Refer to page 10 for information on obtaining these documents. If there is not an SCC number for a process, enter 99999999. SCC numbers can be viewed at: http://www.iowadnr.gov/air/prof/emiss/emiss.html under the "Frequently Used Emissions Inventory Resources" heading.

5) Description Of Process: Provide a written description of the process as defined by the SCC number entered in Box 4 above. If an SCC number and corresponding description is not available for this specific process please provide extra detail.

6) Date of Construction: Enter construction begin date for an emission unit.

7) Date of Installation: This is often the construction date.

8) Date of Modification: If this emission unit was modified since originally installed, please enter the date of the last modification.

9) Raw Material or Fuels Used: Enter the raw material used in this emission unit. For combustion sources with multiple processes or fuels, fill out a separate Form INV-3 for each fuel, each with its own SCC number. List the worst-case pollutant for the emission unit on the appropriate Form INV-3. For example:

> **Combustion Sources — Two Fuels: (Please see this example on pages 56 - 63)**
> Raw Materials -- Two Fuels
> First Form INV-3; Diesel Fuel – SCC 20200401-- list PM_{10}, SO_2, and NO_x
> Second Form INV-3; Dual Fuel -- SCC 20200402-- list $PM_{2.5}$, VOC, CO, Benzene, Formaldehyde, and Toluene
>
> **Non Combustion Sources: (Please see this example on pages 33-37)**
> If different raw materials such as paints or solvents can be used at this emission unit, fill out one Form INV-3, but for each pollutant, list the worst case values. For example:
>
> Raw Material: Paint
> Form INV-3 Paint -- SCC 40202501
> $PM_{2.5}$ and PM_{10} – highest percent by weight is from paint #1;
> VOC – highest percent by weight is from paint #4 and HAPs highest percent by weight is from paint #2

10) Federally Enforceable Limit: If this emission unit is subject to any operating limitation, such as limitations on hours of operation, raw materials, or amount of fuel combusted, etc., enter this limitation here. Enforceable limitations are usually established in the construction/operating permit or in an enforcement order.

11) Permit or Rule Establishing Limit: Enter the source of the operating limitation specified in Box 10. The source may be a construction or operating permit, or an administrative or court order. In either case list the permit number or the order number here. Attach INV-5 if necessary to detail the parameters of the limit.

12) Maximum Hourly Design Rate: Enter maximum hourly production rate for this emission unit, i.e., tons/hour, gallons/hour, etc. This data comes from the equipment vendor or manufacturer rating, not what you typically operate. For combustion units this is the maximum fuel use capacity (in ***MMcf***/hr, gal/hr, or ***1000gal***/hr) for the equipment using the fuel specified in Box 9. Do not confuse this value with an emission rate.

13) Air Pollution Control Equipment Number and Description: Enter the identification number of any equipment used to control emissions from this emission unit. Up to two different control devices may be identified for this emission unit. If there are three or more pieces of control equipment associated with an emission unit, please use the INV-5 form to indicate the additional piece(s) of control equipment.

Potential Emissions

14) Air Pollutant: Besides the eight listed air pollutants there are spaces for six Hazardous Air Pollutants or additional regulated air pollutants. These six boxes are available to list any air contaminants not listed on the form that are emitted from this emission unit. Please indicate the identity of the pollutant by entering the name of the pollutant. If the name of the pollutant is too long to fit, you may use the CAS number. Use additional pages if more than six other pollutants are potentially emitted from this emission unit. **Each HAP must be listed individually.** *Note:* ***Tertiary-Butyl Acetate (TBAC)****, CAS #540-88-5 is no longer considered to be a VOC or HAP, but must still be reported on INV-3 and INV-4 as*

an additional regulated air pollutant per 40 CFR 51.100(s)—"The following compound(s) are VOC for purposes of all recordkeeping, emissions reporting, photochemical dispersion modeling and inventory requirements which apply to VOC and shall be uniquely identified in emission reports, but are not VOC for purposes of VOC emissions limitations or VOC content requirements: t-butyl acetate."

15) Emission Factor: Enter the numerical emission factor (in pounds per unit of measure) used to calculate the potential emissions from this emission unit. As noted at the bottom of the form, emission factors can be obtained for some processes from EPA documents or calculated from stack test data, worksheets, or continuous emission monitoring data. Refer to pages 9 & 10 of this booklet for information on obtaining emission factors. If this emission unit or pollutant is subject to a federally enforceable limit, the limit must be used to calculate potential emissions. Only use lb/hr emission permit limits for emission factors as a last resort.

16) Emission Factor Units: Enter the emission factor units of measure that correspond to the numerical emission factor utilized in Box 15. Typical emission factor units of measure are expressed in pounds of pollutant emitted per unit of production or unit of fuel combusted. Examples are pounds/ton, pounds/gallon, pounds/million cubic feet, etc.

17) Source of Emission Factor: Indicate the emission factor source used in Box 15. See the bottom of Form INV-3 for typical sources of emission factors.

18) Ash or Sulfur %: For combustion sources, the ash or sulfur percent of the fuel may be needed to calculate emissions of particulate matter and sulfur dioxide. The source of the emission factors will state if this is needed. If needed, enter the percent ash in the fuel in the $PM_{2.5}$ & PM_{10} row and the percent sulfur in the SO_2 row.

19) Potential Hourly Uncontrolled Emissions (Lb/Hr): Calculate the potential uncontrolled emissions on an hourly basis and enter the value in pounds per hour. To calculate potential uncontrolled emissions multiply the Maximum Hourly Design Rate (Box 12) by the Emission Factor (Box 15). In order for this calculation to work correctly the emission factor units of measure must correspond to the units of measure used in Box 12. For example, a boiler burning .025 million ft^3 per hour of natural gas times the emission factor of 7.6 pounds of PM-10 per million ft^3 of natural gas burned equals .19 pounds per hour of PM_{10} emitted uncontrolled.

20) Combined Control Efficiency %: If only one emission control device is used enter the percent control efficiency. Be sure to enter the control efficiency in the box corresponding to the air pollutant for which that efficiency is appropriate. See pages 73 - 76 in Appendix C for guidance on ***control efficiencies*** that are accepted by DNR.

If more than one control device applies to the same pollutant at an emission point, the control efficiency is calculated using the following formula:

Control Efficiency = CE1 + CE2 - [(CE1 x CE2) / 100]
where CE1 = Control Efficiency for First Device
CE2 = Control Efficiency for Second Device

When two devices are used to remove the pollutant PM_{10} from the same emission point, the control efficiencies must be combined. For example, if the first device has a control efficiency of 50% and the second device has an efficiency of 80%, the calculation of combined efficiency is as follows:

Control Efficiency = 50 + 80 - [(50 x 80) / 100]
= 130 - [4000 / 100]
= 130 - [40]
= 90%

Thus, the control efficiency for PM_{10} at this emission point is 90%. Do not enter a combined control efficiency if a controlled emission factor has been selected to calculate potential or actual emissions.

21) Transfer Efficiency: For spray coating operations only. Enter the percent of material that adheres to the surface being coated. Table 1 in Appendix D gives typical values for ***transfer efficiencies*** for different types of spraying operations and surfaces. Spray gun manufacturers may also provide transfer efficiencies.

22) Potential Hourly Controlled Emissions (Lb/Hr): Calculate the hourly controlled emissions by using the following formula: [(100-control efficiency from Box 20)/100] x (potential hourly uncontrolled emissions from Box 19.) If the emission unit is uncontrolled, leave box blank. Please note that lb/hr emission permit limits supersede all other values for this box.

23) Potential Annual Controlled Emissions (Tons/Yr): Calculate the annual potential controlled emissions by multiplying the Potential Hourly Controlled Emissions (Box 22) by 8,760 hours and converting pounds per year to tons per year. ***Unless the emission unit is subject to an enforceable limit (Box 10), Potential Emissions are based on 8,760 hours per year.***

For additional information on calculating potential to emit, see Example Calculations and Forms starting on page 25.

Instructions: FORM INV-4

Duplicate if needed and return a completed Form INV-4 (Emission Unit Description-Actual Emissions) for each emission unit at your facility. If an emission unit has multiple processes, complete a separate INV-4 for each process.

1) Company/Facility Name: Enter the company name as it appears on Form INV-1.

1a) Form INV-4 page ___of___: A **separate Form INV-4** must be completed for each process at your plant. An emission unit is the equipment that produces the air pollution emissions, e.g. boiler, paint booth, generators, welders, haul roads, etc. Since many companies will need to use multiple Forms INV-4, this box identifies each page of the total number of Forms INV-4 included.

2) Emission Point Number: Enter the emission point number your company assigns to this stack or vent. This must be the same numbering scheme as used on Form INV-2. Please use the same numbering scheme as any previous MSEI and/or construction permits and use it consistently.

Emission Unit - Actual Operations and Emissions

3) Emission Year: Enter the calendar year for which you are calculating ACTUAL emissions from this emission unit and its processes. Usually this will be the previous year.

4) Emission Unit Number: Enter the identification number your company assigns to this emission unit. This must be the same numbering scheme as used on Form INV-2 and throughout the application. Naming and numbering of emission points and emission units should be consistent with any previous MSEI completed and with any construction permits. Please request assistance for help in resolving any numbering or naming inconsistencies. Keep in mind that an emission unit is the specific equipment, e.g. boiler, paint booth, which generates the air pollution emissions and may have multiple processes.

5) SCC Number: Enter the Source Classification Code Number (SCC) that identifies the type of process or activity occurring at this emission unit. The SCC number corresponds to the Description of Process (Box 6) and specific "emission factor units"(lb/ton, lb/gal, etc.). If there is not an SCC number for a process, enter 99999999.

6) Description Of Process: Provide a written description of the process as defined by the SCC number entered in Box 5 above. If an SCC number and corresponding description is not available for this specific process, please provide your best description of the process.

Actual Throughput

7) Raw Material: Identify the raw material used in this emission unit. For combustion sources the raw material is the fuel combusted. If an emission unit has more than one process or fuel (i.e., fuel oil and natural gas), **separate Forms INV-4** must be completed for each fuel used or raw material processed except for paint booths.

8) Actual Throughput - Yearly Total: Enter the actual amount of the raw material (identified in Box 7) that the emission unit processed during the emission year specified in Box 3.

9) Units Raw Material: Enter the units of measure (tons, gallons, bushels, million cubic feet, etc.) of the raw material total specified in Box 8.

Actual Operating Rate/Schedule

10) Percent of Total Operating Time: For each of the four calendar quarters, specify the percentage of the total annual throughput attributable to each quarter. Estimates are acceptable. The total for all four quarters must equal 100%.

11) Hours/Day: This figure is the normal number of hours per day that the equipment or process (Emission Unit) was in operation. Since some processes operate on a different daily schedule over the course of the year, enter the hours per day the emission unit operated during each of the four calendar quarters.

12) Days/Week: This figure is the normal number of days per week that the equipment or process (Emission Unit) was in operation. Since some processes are operated on a different weekly schedule over the course of the year, enter the days per week that the emission unit operated during each of the calendar quarters.

13) Weeks / 13 Week Quarter: For each calendar quarter enter the number of weeks the emission unit operated. There are 13 possible weeks of operation in each calendar quarter.

Example: ACME Corporation operated 8 hours per day, 5 days a week from Jan 1 – Sept 30, and 4 hours per day, 5 days a week from Oct 1 – Dec 31.

Actual Operating Rate/Schedule				
	10) Percent of Total Operating Time	11) Hours/Day	12) Days/Week	13) Weeks/Quarter
JAN – MAR	28.57	8	5	13
APR – JUN	28.57	8	5	13
JUL – SEP	28.57	8	5	13
OCT - DEC	14.29	4	5	13

(8 hrs/day) x (5 days/week) *x* (13 weeks/quarter) = (520 hours/quarter) *x* (3 quarters/year) = 1,560 hours
(4 hrs/day) x (5 days/week) *x* (13 weeks/quarter) = (260 hours/quarter) *x* (1 quarter/year) = 260 hours

Total hours operated = 1,820 hours
Jan – Mar = 520 hrs/1,820 hrs *x* 100 = 28.57%
Apr – Jun = 520 hrs/1,820 hrs *x* 100 = 28.57%
July – Sep = 520 hrs/1,820 hrs *x* 100 = 28.57%
Oct – Dec = 260 hrs/1,820 hrs *x* 100 = 14.29%

Air Pollution Control Equipment

14) Control Equipment (CE) Number: Enter the air pollution emissions control equipment identification number(s) and describe each, such as 'baghouse' or 'cyclone.'

Actual Emissions

15) Air Pollutant: Besides the eight listed air pollutants there are spaces for six Hazardous Air Pollutants or additional regulated air pollutants. These six boxes are available to list any air contaminants not listed on the form that are emitted from this emission unit. Please indicate the identity of the pollutant by entering the name of the pollutant. If the name of the pollutant is too long to fit, you may use the CAS number. Use additional pages if more than six other pollutants are potentially emitted from this emission unit. **Each HAP must be listed individually.** *Note:* ***Tertiary-Butyl Acetate (TBAC)****, CAS #540-88-5 is no longer considered to be a VOC or HAP, but must still be reported on INV-4 as an additional regulated air pollutant.*

16) Emission Factor: Enter the numerical emission factor (in pounds per units of measure) used to calculate the actual emissions from this emission unit. As noted at the bottom of the form, emission factors can be obtained for some

processes from EPA documents or calculated from stack test data, worksheets, or continuous emission monitoring data. (See page 9 for details). Only use lb/hr emission permit limits for emission factors as a last resort.
17) Emission Factor Units: Enter the emission factor units of measure that correspond to the numerical emission factor utilized in Box 16. Typical emission factor units of measure are expressed in pounds of pollutant emitted per unit of production or unit of fuel combusted. Examples are pounds/ton, pounds/gallon, pounds/million cubic feet, etc.

18) Source of Emission Factor: Indicate the source of the emission factor used in Box 17. See the bottom of Form INV-4 for typical sources of emission factors.

19) Ash or Sulfur %: For combustion sources the ash or sulfur percent of the fuel may be needed to calculate emissions of particulate matter and sulfur oxides. The source of the emission factors will state if this is needed. If needed, enter the percent ash in the fuel in the $PM_{2.5}$ & PM_{10} row and the percent sulfur in the SO_2 row.

20) Combined Control Efficiency %: The same control efficiency as in Box 20 on Form INV-3 should be used.

21) Transfer Efficiency: For spray coating operations only. Enter the percent of material that adheres to the surface being coated. Table 1 in Appendix D gives typical values for transfer efficiencies for different types of spraying operations and surfaces. Manufacturers may also provide transfer efficiencies for their equipment.

22) Actual Emissions (Tons/Yr): This is the amount in tons per year of the pollutant emitted at the emission unit described. All figures should be rounded to two decimal places. For example, assume the actual ***throughput*** is 30,000 tons of grain processed, the PM_{10} emission factor is 0.91 pounds of PM_{10} emitted per ton of grain processed and a PM_{10} control device for this emission point has an efficiency of 90%.

Actual Emissions =
Actual Throughput (Box 9) x Emission Factor x [(100 – Percent Control Efficiency)/100]/ 2000.

Actual Emissions = 30,000 tons x 0.91 lbs/ton x [(100 - 90) / 100] / 2,000 lbs/ton
= 27,300 lbs x [10 / 100] / 2,000 lbs/ton
= 27,300 lbs x [.1] / 2,000 lbs/ton
= 2,730 lbs / 2,000 lbs/ton
= 1.37 tons of PM_{10} emitted per year

Note: Do not enter a combined control efficiency if a controlled emission factor has been selected to calculate potential or actual emissions.

Note: If no control devices are used, the Control Efficiency is 0%.
Actual Emissions = (30,000 tons x 0.91 lbs/ton) / 2,000 lbs/ton
= 27,300 lbs / 2,000 lbs/ton
= 13.65 tons of PM_{10} emitted per year

For additional examples on calculating actual emissions, see Example Calculations and Forms starting on page 25.

Form Instructions: FORM INV-5

Duplicate if needed and attach Form INV -5 Calculations to the form that it is documenting.

This form is a calculation worksheet to document how you calculated values on other individual forms throughout this MSEI. Include a description of any assumptions used in making the calculations.

KEEP A COPY OF YOUR COMPLETED MSEI INCLUDING CALCULATION SHEETS!
NOTE: If you are using SPARS, there is not a separate tab for Form INV-5. Use the text box on the calculations tabs on forms INV-3 and INV-4 to show calculations or list all calculations on a Word document or Excel spreadsheet and attach to INV-1 in SPARS.

1) Facility Name: Enter the company/facility name as it appears on Form INV-1.

1a) Form INV-2 - page___of___: Since some companies may need to use multiple Forms INV-5, this box identifies each page of the total number of Forms INV-5 that has been included.

2) Emission Point Number: Enter the number of the emission point (stack or vent) associated with the calculations you are documenting on this form.

3) Emission Unit Number: Enter the number of the emission unit (process) associated with the calculations you are documenting on this form.

4) Calculations are Provided in Support of Information Reported on Form_INV__ ,for the Emission Point and Emission Unit listed above: Check the box of the Form number for which this calculation sheet provides supporting documentation. Check both boxes if ***Potential*** and ***Actual*** Emissions have been included on the same page.

5) Emission Calculations: This space is provided for you to show your calculations. This documentation will allow DNR staff to follow how certain values were calculated. Please provide legible calculations. Attachments to Form INV-5 are acceptable.

Example Calculations and Forms

Introduction

This section provides example calculations and forms to show how emission estimation methods are used to develop an inventory for both potential and actual emissions. There are six basic approaches or methods used to develop emission estimates and inventories. These methods are:

- Continuous emissions monitoring
- Stack test data
- Material balance
- EPA approved emission factors
- Vendor supplied factors
- Engineering estimates based on best available process operating data

Most sources will use material balance and emission factors for estimating emissions. These two methods will be the focus of this section. Each example calculation shows how the method may be used for a specific emissions source category. It is intended that the reader use the information to apply the methods to other applicable source categories.

Potential Emissions

Potential to emit is calculated assuming equipment is running at maximum capacity while operating at the maximum hours of operation under its physical and operational design. Usually, maximum hours of operation are 8,760 hours per year unless enforceable limitations on hours of operation have been incorporated within the construction permit or an enforcement order for that equipment.

Only federally enforceable limitations on raw materials, fuels, capacity or hours of operation can be used to limit potential emissions. 'Bottlenecks' do not count unless federally enforceable.

Calculation of potential emissions must be done with "worst case" values for each pollutant. An example would be emissions from solvent use at a facility. Solvent A contains 3 lb/gal toluene and 2 lb/gal benzene, while solvent B contains 1 lb/gal toluene and 4 lb/gal benzene. Solvent emissions would be calculated based on the solvent A toluene value of 3 lb/gal and the solvent B benzene value of 4 lb/gal.

Calculating potential to emit with control equipment general equation:

(Maximum Hourly Design Rate) x (Emission factor) x (Control Efficiency) x (Potential hours) x (conversion factor to tons) = tons per year

Rate: Process rate is based on the maximum design rate of the equipment, i.e., lb/hr, gal/hr, or MMcf/hr

Emission factors are emission values based on throughput i.e., lb/ton, lb/gal, or lb/MMcf.

Control Efficiency = Control equipment pollutant removal efficiency

Potential hours will be 8,760 hr/yr unless there is a federally enforceable limit such as a construction permit which limits the number of hours the emission unit can operate.

To convert to tons, see the conversion factors listed on pages 77 & 78 in Appendix D.

Actual Emissions

Actual emissions are the actual rate of pollution emissions from an emission unit calculated using the emission unit's actual operating hours, production rates, and types of materials processed, stored, or combusted for the calendar year.

General equation for calculating actual emissions with control equipment:

(Actual Throughput) x (Emission Factor) x (Control Efficiency) x (conversion factor to tons) = tons per year

***Actual Throughput*:** Amount of material actually used for the calendar year such as gallons per year, tons per year, million cubic feet per year, etc.

Emission factors are emission values based on throughput such as lb/ton, lb/gal, or lb/MMcf.

Control Efficiency is the control equipment pollutant removal efficiency.

To convert to tons, see the conversion factors listed on pages 77 & 78 in Appendix D.

Example MSEI's

The following example shows how calculations are performed and where data is reported on the inventory forms.

ACME Corporation manufactures grain wagons and has three reportable emission units including a welding station, paint booth, and No. 2 fuel oil-fired boiler. Each emission unit has one emission point associated with it. The emission points, emission units, and any control equipment were identified and assigned a number.

ACME Hospital has four reportable emission units including a natural gas-fired boiler, two diesel-fired generators, and dual-fuel fired generator.

For each emission point, information was gathered on stack dimensions, height, flow rate (fan rating), and temperature. Information gathered for each emission unit included a description of the process, raw materials used, the maximum design rate, and any permit limits. If there is an air quality construction permit for the emission source, most of this information can be found in the permit.

The next step was finding emission factors in EPA documents for each pollutant produced by the boiler and welding station. A mass balance was performed on the paint booth, so Material Safety Data Sheets (MSDS) were gathered for all paints used in the calendar year.

The following calculations were performed and inventory forms for ACME Corporation and ACME Hospital were completed:

AIR QUALITY BUREAU
7900 Hickman Rd., Suite 1
Urbandale, IA 50322

IOWA DNR Minor Source Emission Inventory

Form INV-1 Facility Identification

1) Application Type	Initial ☒	Supplemental Information ☐	
2) Facility Number	##-05-025		
3) Company/Facility Name	ACME CORPORATION		
4) Emission Year	2008		
5) Facility Street Address	111 N 2ND ST		
6) Facility City	ANYTOWN		IA
7) Zip Code	55555		
8) Facility Contact Person	JOHN BEEMER		
9a) Facility Contact Phone Number	515-555-5555		
9b) Facility Contact E-mail Address	jbeemer@emailacmecorp		
10) Mailing Street/PO Box	PO BOX 123		
11) Mailing City	ANYTOWN		
12) State	IA		
13) Zip Code	55555		
14) Parent Company / Owner Name			
15) Parent Company / Owner Mailing Address			
16) City			
17) State			
18) Zip Code			
19) Parent Company Contact/Agent			
20) Parent Company Contact Phone Number			
21) Standard Industrial Classification (SIC)	3523		
22) Activity Description	Manufacture farm equipment – grain wagons		
23) SECONDARY ACTIVITIES			
SIC			
Activity Description			
SIC			
Activity Description			
24) PLANT LOCATION			
Latitude	41.605621		
Longitude	-93.588353		

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4000. December 24, 2007)

Form INV-2 EMISSION POINT DESCRIPTION

Duplicate this form for EACH Emission POINT

1) Company/Facility Name	ACME CORPORATION	1a) Form INV-2 Page	1	of	3
2) Emission Point Number	EP1				
3) Emission Point Description	WELDING VENT				
4) Is this stack/vent used as an Emergency Bypass Stack?	No ☒	Yes ☐			
If YES, for which stack(s)? List Emission Point Nos.:					

EMISSION POINT INFORMATION

5) Emission Point Type

Stack/Vent	☒	
Fugitive (specify)	☐	
Other (specify)	☐	

6) Stack Shape and Dimensions: (interior dimensions at exit point)

Circular Diameter:	☐		inches			
Rectangular Dimensions:	☒	8	inches	x	10	inches
Other Dimensions	☐		inches			

7) Stack Height Above Ground	12	feet

8) Does the Emission Point have a rain cap (or anything else) which obstructs the flow of gases leaving the Emission Point, or a horizontal discharge?

No	☐	YES (specify):	☒	HORIZONTAL DISCHARGE

9) COMPOSTION OF EXHAUST STREAM

Exhaust Stream Characteristics	Emission Point Composition of Exhaust Stream	Units of Measure
a) Flow Rate	900	☒ ACFM ☐ SCFM
b) Temperature	Ambient	Degree Fahrenheit

10) BYPASS STACKS

Bypass Stack – Emission Point No.		Bypass Stack Description	
Bypass Stack – Emission Point No.		Bypass Stack Description	

11) LIST OF EMISSION UNITS VENTING THROUGH THIS EMISSION POINT

Emission Unit No.	Emission Unit No	Emission Unit No.	Emission Unit No.
EU1			

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4004. December 24, 2007)

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME CORPORATION			1a) Form INV-5 Page	1	of	5
2) Emission Point No.	EP1	3)	Emission Unit No.	EU1			
4) Calculations are provided in support of information reported on Form INV -	3 ☒	4 ☒	for the Emission Point and Emission Unit listed above.				
5) Emissions Calculations							

Process: Gas Metal Arc Welding, E308 Electrode
SCC No.: 30905212

Maximum rate: 30 lb of electrode per hour
Actual Year Throughput – Yearly Total: 40,000 pounds of electrode

Pollutant	Emission Factors from AP-42, Chapter 12.19
$PM_{2.5}$	5.4 lb/1,000 lbs of electrode consumed ($PM_{2.5}$ is assumed to be equal to PM_{10} for welding)
PM_{10}	5.4 lb/1,000 lbs of electrode consumed
Chromium	0.524 lb/1,000 lbs of electrode consumed
Manganese	0.346 lb/1,000 lbs of electrode consumed
Nickel	0.184 lb/1,000 lbs of electrode consumed

Calculations

POTENTIAL EMISSIONS:
Potential $PM_{2.5}$ tons/yr
Potential PM_{10} tons/yr

(.030 1,000 lb/hr) *x* (5.4 lb/1,000 lbs) *x* (8,760 hrs/year) *x* (1 ton/2,000 lbs) = 0.71 tons per year

The same formula is used to calculate the other pollutants with their corresponding emission factors.

Potential Chromium tons/yr = 0.07
Potential Manganese tons/yr = 0.05
Potential Nickel tons/yr = 0.02

ACTUAL EMISSIONS:
Actual $PM_{2.5}$ tons
Actual PM_{10} tons

(40 1,000 lbs) *x* (5.4 lb/1,000lbs) *x* (1 ton/2,000 lbs) = 0.11 tons

The same formula is used to calculate the other pollutants with their corresponding emission factors.

Actual Chromium tons = 0.01
Actual Manganese tons = 0.01
Actual Nickel tons = 0.00

Form INV-3 EMISSION UNIT DESCRIPTION – POTENTIAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME CORPORATION	1a) Form INV-3 Page	1	of	3	
2)	Emission Point Number	EP1					

EMISSION UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

3)	Emission Unit Number	EU1					
4)	SCC Number	30905212					
5)	Description of Process	GAS METAL ARC WELDING					
6)	Date of Construction	2/15/1985	7) Date of Installation	2/15/1985	8)	Date of Modification	
9)	Raw Material – OR Fuels Used List worst case for EACH pollutant	E308 WELDING WIRE					
10)	Federally Enforceable Limit						
11)	Permit or Rule Establishing Limit						
12)	Maximum Hourly Design Rate	0.030	1,000 POUNDS		Per Hour		

13) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

POTENTIAL EMISSIONS

14 Air Pollutant	15 Emission Factor	16 Emission Factor Units	17 Source of Emission Factor	18 Ash or Sulfur %	19 Potential Hourly Uncontrolled Emissions (Lbs/Hr)	20 Combined Control Efficiency	21 Transfer Efficiency	22 Potential Hourly Controlled Emissions (Lbs/Hr)	23 Potential Annual Emissions (Tons/Yr)
PM-2.5	5.4	LB/1,000 LB	AP-42		0.16				0.71
PM-10	5.4	LB/1,000 LB	AP-42		0.16				0.71
SO_2									
NOx									
VOC									
CO									
Lead									
Ammonia									
POTENTIAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 14									
Cr	0.524	LB/1,000 LB	AP-42		0.02				0.07
Mn	0.346	LB/1,000 LB	AP-42		0.01				0.05
Ni	0.184	LB/1,000 LB	AP-42		0.01				0.02

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4001. December 24, 2007)

Form INV-4 EMISSION UNIT DESCRIPTION – ACTUAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1) Company/Facility Name	ACME CORPORATION			1a) Form INV-4 Page	1	of	3
2) Emission Year	2008	3) Emission Point Number		EP1			

EMISSION UNIT – ACTUAL OPERATIONS AND EMISSIONS

4) Emission Unit Number	EU1	5) SCC Number	30905212
6) Description of Process	GAS METAL ARC WELDING		

ACTUAL THROUGHPUT

7) Raw Material	ELECTRODE E308		
8) Actual Throughput – Yearly Total	40	9) Units Raw Material	1,000 POUNDS

Actual Operating Rate/Schedule

	10) Percent of Total Operating Time	11) Hours/Day	12) Days/Week	13) Weeks/Quarter
JAN – MAR	25	8	6	13
APR – JUN	25	8	6	13
JUL – SEP	25	8	6	13
OCT - DEC	25	8	6	13

14) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

ACTUAL EMISSIONS

15 Air Pollutant	16 Emission Factor	17 Emission Factor Units	18 Source of Emission Factor	19 Ash or Sulfur %	20 Combined Control Efficiency	21 Transfer Efficiency	22 Actual Emissions (Tons/Yr)
PM-2.5	5.4	LB/1,000 LB	AP-42				0.11
PM-10	5.4	LB/1,000 LB	AP-42				0.11
SO_2							
NOX							
VOC							
CO							
Lead							
Ammonia							
ACTUAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 15							
Cr	0.524	LB/1,000 LB	AP-42				0.01
Mn	0.346	LB/1,000 LB	AP-42				0.01
Ni	0.184	LB/1,000 LB	AP-42				0.00

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4002 December 24, 2007)

Form INV-2 EMISSION POINT DESCRIPTION

Duplicate this form for EACH Emission POINT

1) Company/Facility Name	ACME CORPORATION	1a) Form INV-2 Page	2	of	3
2) Emission Point Number	EP2				
3) Emission Point Description	SPRAY PAINT BOOTH STACK				
4) Is this stack/vent used as an Emergency Bypass Stack?	No ☒	Yes ☐			
If YES, for which stack(s)? List Emission Point Nos.:					

EMISSION POINT INFORMATION

5) Emission Point Type

Stack/Vent	☒	
Fugitive (specify)	☐	
Other (specify)	☐	

6) Stack Shape and Dimensions: (interior dimensions at exit point)

Circular Diameter:	☒	30	inches			
Rectangular Dimensions:	☐		inches	X		inches
Other Dimensions	☐		inches			

7) Stack Height Above Ground	18	feet	

8) Does the Emission Point have a rain cap (or anything else) which obstructs the flow of gases leaving the Emission Point, or a horizontal discharge?

No	☐	YES (specify):	☒	RAIN CAP

9) COMPOSTION OF EXHAUST STREAM

Exhaust Stream Characteristics	Emission Point Composition of Exhaust Stream	Units of Measure
a) Flow Rate	18,000	☒ ACFM ☐ SCFM
b) Temperature	ambient	Degree Fahrenheit

10) BYPASS STACKS

Bypass Stack – Emission Point No.		Bypass Stack Description	
Bypass Stack – Emission Point No.		Bypass Stack Description	

11) LIST OF EMISSION UNITS VENTING THROUGH THIS EMISSION POINT

Emission Unit No.	Emission Unit No	Emission Unit No.	Emission Unit No.
EU2			

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4004. December 24, 2007)

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME CORPORATION			1a) Form INV-5 Page	2	of 5
2) Emission Point No.	EP2	3)	Emission Unit No.	EU2		
4) Calculations are provided in support of information reported on Form INV -	3 ☒	4 ☐	for the Emission Point and Emission Unit listed above.			
5) Emissions Calculations						

ACME Corporation applies a base coat and a top coat to each wagon in the same spray booth. The paint comes in five gallon pails and is sprayed directly from the container with no thinning or mixing at the facility. The paint booth has an Iowa Air Quality construction permit with a paint usage limit of 4,000 gallons per year. ACME Corp only sprayed 1,300 gallons per year (500 gallons of basecoat and 800 gallons of top coat). ACME Corp. uses a high volume low pressure (HVLP) spray gun with a maximum capacity of 7 gallons/hr. The filter used in the booth has a 95 percent particulate removal efficiency.

Material balance (also known as mass balance) utilizes the raw material usage rate to estimate the amount of pollutant emitted. In this method, emissions are estimated as the difference between material input and material output across a process. This method is typically used in surface coating processes. Information regarding the amount of pollutants in a material can be found on the material safety and data sheet (MSDS).

Most material balances assume that all solvent used in a process will evaporate to become air emissions somewhere at the facility. In these cases, emissions equal the amount of solvent contained in the surface coating.

From information found on paint MSDS the top and base coats have the following characteristics and HAP components: (ref HAP/HAP list)

	Top Coat	Base Coat
Paint Weight (lbs/gal)	8.75	7.21
% VOC	25	42
% Solids	75	58
% Xylene	8	2
% Toluene	0	15

Note: All percents are weight percents and expressed as percent of total paint weight

POTENTIAL EMISSIONS:

Step 1 - Determine the maximum amount of paint that could be used

Since ACME Corp. has a usage limit of **4,000** gallons per year, this is the maximum amount of paint that could be used. If they didn't have this limit, the maximum usage would be calculated by taking the maximum gun capacity (7 gallon/hr), and multiplying by 8,760 hours per year.

(7 gallon/hr) x (8,760 hrs/yr) = 61,320 gallons/yr

Step 2 - Calculate the yearly potential VOC and HAP emissions

To calculate the maximum amount of VOC and HAP emitted from this spray booth in one year, the highest amounts of each constituent from the base or top coat must be used.

In this case the top coat VOC = 0.25 x 8.75 lbs/gal = 2.19 lbs VOC/gal.
The base coat VOC = 0.42 x 7.21 lbs/gal = 3.03 lbs VOC/gal, which is the higher VOC content.

First, multiply the greatest VOC density (base coat 3.03 lbs/gal) by the maximum paint used (4,000 gallons). To convert it to tons per year divide the answer by 2,000 lbs/ton.

(Density lbs/gal) *x* (Max. annual paint usage gal/yr) *x* (1 ton/2,000 lb) = 3.03 lbs/gal x 4,000 gal/yr x 1ton/2,000 lbs = 6.06 tons/yr

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME CORPORATION			1a) Form INV-5 Page	3	of	5
2) Emission Point No.	EP2	3)	Emission Unit No.	EU2			
4) Calculations are provided in support of information reported on Form INV -	3 ☒	4 ☐	for the Emission Point and Emission Unit listed above.				
5) Emissions Calculations							

POTENTIAL EMISSIONS (CONTINUED)

To calculate the maximum emissions of each HAP, use the same formula, but in each case use the paint with the highest density of the HAP.

Xylene = (8.75 lb/gal) *x* (4,000 gallon/yr) *x* (0.08) *x* (1 ton/2,000 lbs) = **1.40 tons/yr**
Toluene = (7.21 lb/gal) *x* (4,000 gallon/yr) *x* (0.15) *x* (1 ton/2,000 lbs) = **2.16 tons/yr**

Step 3 - Calculate the yearly potential $PM_{2.5}$ and PM_{10} emissions. For surface coating, $PM_{2.5}$ and PM_{10} are assumed to be equal. To calculate $PM_{2.5}$ and PM_{10} emissions the spray transfer efficiency (TE) of the spray gun and the control efficiency (CE) of the filter must be inserted in the formula used to calculate the VOC and HAP emissions. The transfer efficiency is the percentage of paint from the gun that actually adheres to the part being painted. The HVLP gun has a transfer efficiency of 65%, and the filter control efficiency is 95%. Refer to Appendices C and D or other supporting documentation for guidance on transfer and control efficiencies.

In ACME Corp.'s painting process 65% of the paint being sprayed hits the part and the remaining (35%) goes in the exhaust stream. The filters capture 95% of the solids in the exhaust and the remaining (5%) is discharged out the stack.

(Density lb/gal) *x* (Max. annual paint usage gal/yr) *x* (Max.% solid) *x* (1-TE) *x* (1-CE) *x* (1 ton/2000 lbs)

(8.75 lb/gal) *x* (4,000 gal/yr) *x* (0.75) *x* (1-0.65) *x* (1-0.95) *x* (1 ton/2,000 lbs) = **0.23 tons/yr**

Step 4 - Calculating maximum hourly emissions
To calculate maximum hourly emissions multiply the maximum gun capacity by the weight of the highest constituent, considering all paints used. The lb/gal density for each paint, multiplied by the percent of the pollutant in each paint equals a pound per gallon emission factor. To calculate the hourly PM_{10} emissions the transfer efficiency and filter control efficiency must be included in the formula.

(Max. Gun Capacity gal/hr) *x* (Density lbs/gal *x* Max. % VOC/HAP) = VOC or HAP
(Max. Gun Capacity gal/hr) *x* (Density lbs/gal *x* Max. % solids) *x* (1-TE) *x* (1-CE) = PM_{10}

VOC s = (7 gal/hr) *x* (7.21 lb/gal *x* 0.42) = **21.20 lb/hr**
Xylene = (7 gal/hr) *x* (8.75 lb/gal *x* 0.08) = **4.9 lb/hr**
Toluene = (7 gal/hr) *x* (7.21 lb/gal *x* 0.15) = **7.57 lb/hr**
$PM_{2.5}$ = (7 gal/hr) *x* (8.75 lb/gal *x* 0.75) = 45.94 lb/hr uncontrolled *x* (1-0.65) *x* (1-0.95) = **0.80 lb/hr controlled**
PM_{10} = (7 gal/hr) *x* (8.75 lb/gal *x* 0.75) = 45.94 lb/hr uncontrolled *x* (1-0.65) *x* (1-0.95) = **0.80 lb/hr controlled**

Step 5 – Calculate the emission factor
To determine the emission factor to report in Box 15, divide the lb/hr uncontrolled potential emissions by the gallons/hr capacity.

(lb/hr emissions uncontrolled) x (hr/gallons) = lb/gal

VOC s = (21.20 lb/hr) x (hr/7 gal) = 3.03 lb/gal
Xylene = (4.9 lb/hr) x (hr/7 gal) = 0.7 lb/gal
Toluene = (7.57 lb/hr) x (hr/7 gal) = 1.08 lb/gal
$PM_{2.5}$ = (45.94 lb/hr) x (hr/7 gal) = 6.56 lb/gal
PM_{10} = (45.94 lb/hr) x (hr/7 gal) = 6.56 lb/gal

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME CORPORATION			1a) Form INV-5 Page	4	of	5
2) Emission Point No.	EP2	3)	Emission Unit No.	EU2			
4) Calculations are provided in support of information reported on Form INV -	3 ☐	4 ☒	for the Emission Point and Emission Unit listed above.				
5) Emissions Calculations							

ANNUAL ACTUAL EMISSIONS:

Step 6 - Calculating annual actual VOC and HAP emissions

To calculate annual VOC and HAP emissions you must calculate the emissions from each coating then add them together.

(Paint used gal/yr) *x* (Paint Weight lb/gal *x* Pollutant %) *x* (1 ton/2,000 lbs)

VOC - Top Coat: (800 gal) *x* (8.75 lb/gal *x* 0.25) = 1,750 lb *x* (1 ton/2,000 lbs) = 0.875 tons
VOC - Base Coat: (500 gal) *x* (7.21 lb/gal *x* 0.42) = 1,514 lb *x* (1 ton/2,000 lbs) = 0.75 tons
\+ _____
1.63 tons of VOC

Xylene - Top Coat: (800 gal) *x* (8.75 lb/gal *x* 0.08) = 560 lb *x* (1 ton/2,000 lbs) = 0.28 tons
Xylene -Base Coat: (500 gal) *x* (7.21 lb/gal *x* 0.02) = 72.1 lb *x* (1 ton/2,000 lbs) = 0.04 tons
\+ _____
0.32 tons of Xylene

Toluene -Top Coat: (800 gal) *x* (8.75 lb/gal *x* 0.00) = 0.00 lb *x* (1 ton/2,000 lbs) = 0.0 tons
Toluene -Base Coat: (500 gal) *x* (7.21 lb/gal *x* 0.15) = 540.75 lb *x* (1 ton/2,000 lbs) = 0.27 tons
\+ _____
0.27 tons of Toluene

Step 7 - Calculating yearly $PM_{2.5}$ and PM_{10} emissions

To calculate the yearly $PM_{2.5}$ and PM_{10} emissions, the same formula is used, but transfer efficiency and control efficiency must be taken into account.

Top Coat: (800 gal) *x* (8.75 lb/gal *x* 0.75) *x* (1-0.65) *x* (1-0.95) = 91.88 lb *x* (1 ton/2,000 lbs) = 0.05 tons
Base Coat: (500 gal) *x* (7.21 lb/gal *x* 0.58) *x* (1-.65) *x* (1-0.95) = 36.59 lb *x* (1 ton/2,000 lbs) = 0.02 tons
\+ _____
0.07 tons of $PM_{2.5}$ and PM_{10}

Note: This example is for a painting operation where the paint is not thinned on-site. If thinning occurs on-site this must be taken into account to determine the maximum constituents of each coating. For additional guidance on this contact the Department of Natural Resources or the Iowa Waste Reduction Center.

Step 8– Calculate the emission factor

To determine the emission factor to report in Box 15, divide the total tons emissions by the gallons used and convert tons to pounds.

[(tons) / (gallons)] x (2,000 lbs/ton) = lb/gal

VOC s = (1.63 tons/1,300 gallons x 2,000 lbs/ton) = 2.51 lb/gal
Xylene = (0.32 tons/1,300 gallons x 2,000 lbs/ton) = 0.49 lb/gal
Toluene = (0.27 tons/1,300 gallons x 2,000 lbs/ton) = 0.42 lb/gal
$PM_{2.5}$ = (0.07 tons/1,300 gallons x 2,000 lbs/ton) x (1/1-.95) x (1-.65) = 6.15 lb/gal
PM_{10} = (0.07 tons/1,300 gallons x 2,000 lbs/ton) x (1/1-.95) x (1-.65) = 6.15 lb/gal

Form INV-3 EMISSION UNIT DESCRIPTION – POTENTIAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME CORPORATION	1a) Form INV-3 Page	2	of	3	
2)	Emission Point Number	EP2					

EMISSION UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

3)	Emission Unit Number	EU2						
4)	SCC Number	40202501						
5)	Description of Process	SPRAY PAINTING						
6)	Date of Construction	8/1/1985	7)	Date of Installation	8/1/1985	8)	Date of Modification	
9)	Raw Material – OR Fuels Used List worst case for EACH pollutant	PAINT						
10)	Federally Enforceable Limit	4,000 GALLONS PER YEAR						
11)	Permit or Rule Establishing Limit	CONSTRUCTION PERMIT 85-A-036						
12)	Maximum Hourly Design Rate	7.0	GALLONS				Per Hour	

13) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	CE1
Control Equipment Description	PANEL FILTER
Control Equipment Number	
Control Equipment Description	

POTENTIAL EMISSIONS

14 Air Pollutant	15 Emission Factor	16 Emission Factor Units	17 Source of Emission Factor	18 Ash or Sulfur %	19 Potential Hourly Uncontrolled Emissions (Lbs/Hr)	20 Combined Control Efficiency	21 Transfer Efficiency	22 Potential Hourly Controlled Emissions (Lbs/Hr)	23 Potential Annual Emissions (Tons/Yr)
PM-2.5	6.56	LB/GAL	MASS BAL		45.92	95	65	0.8	0.23
PM-10	6.56	LB/GAL	MASS BAL		45.92	95	65	0.8	0.23
SO_2									
NOx									
VOC	3.03	LB/GAL	MASS BAL		21.21				6.06
CO									
Lead									
Ammonia									
POTENTIAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 14									
Xylene	0.7	LB/GAL	MASS BAL		4.9				1.40
Toluene	1.08	LB/GAL	MASS BAL		7.56				2.16

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4001. December 24, 2007)

Form INV-4 EMISSION UNIT DESCRIPTION – ACTUAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME CORPORATION		1a) Form INV-4 Page	2	of	3
2)	Emission Year	2008	3) Emission Point Number	EP2			

EMISSION UNIT – ACTUAL OPERATIONS AND EMISSIONS

4)	Emission Unit Number	EU2	5) SCC Number	40202501
6)	Description of Process	SPRAY PAINT BOOTH		

ACTUAL THROUGHPUT

7)	Raw Material	PAINT			
8)	Actual Throughput – Yearly Total	1,300	9)	Units Raw Material	GALLONS

Actual Operating Rate/Schedule

	10) Percent of Total Operating Time	11) Hours/Day	12) Days/Week	13) Weeks/Quarter
JAN – MAR	25	8	5	13
APR – JUN	25	8	5	13
JUL – SEP	25	8	5	13
OCT - DEC	25	8	5	13

14) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	CE2
Control Equipment Description	PANEL FILTER
Control Equipment Number	
Control Equipment Description	

ACTUAL EMISSIONS

15 Air Pollutant	16 Emission Factor	17 Emission Factor Units	18 Source of Emission Factor	19 Ash or Sulfur %	20 Combined Control Efficiency	21 Transfer Efficiency	22 Actual Emissions (Tons/Yr)
PM-2.5	6.15	LB/GAL	MASS BAL		95	65	0.07
PM-10	6.15	LB/GAL	MASS BAL		95	65	0.07
SO_2							
NOX							
VOC	2.51	LB/GAL	MASS BAL				1.63
CO							
Lead							
Ammonia							
ACTUAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 15							
Xylene	0.49	LB/GAL	MASS BAL				0.32
Toluene	0.42	LB/GAL	MASS BAL				0.27

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4002 December 24, 2007)

Form INV-2 EMISSION POINT DESCRIPTION

Duplicate this form for EACH Emission POINT

1) Company/Facility Name	ACME CORPORATION	1a) Form INV-2 Page	3	of	3
2) Emission Point Number	EP3				
3) Emission Point Description	BOILER STACK				
4) Is this stack/vent used as an Emergency Bypass Stack?	No ☒	Yes ☐			
If YES, for which stack(s)? List Emission Point Nos.:					

EMISSION POINT INFORMATION

5) Emission Point Type

Stack/Vent	☒	
Fugitive (specify)	☐	
Other (specify)	☐	

6) Stack Shape and Dimensions: (interior dimensions at exit point)

Circular Diameter:	☒	24	inches			
Rectangular Dimensions:	☐		inches	X		inches
Other Dimensions	☐		inches			

7) Stack Height Above Ground	35	feet	

8) Does the Emission Point have a rain cap (or anything else) which obstructs the flow of gases leaving the Emission Point, or a horizontal discharge?

No	☐	YES (specify):	☒	RAIN CAP

9) COMPOSTION OF EXHAUST STREAM

Exhaust Stream Characteristics	Emission Point Composition of Exhaust Stream	Units of Measure
a) Flow Rate	6,100	☒ ACFM ☐ SCFM
b) Temperature	350	Degree Fahrenheit

10) BYPASS STACKS

Bypass Stack – Emission Point No.		Bypass Stack Description	
Bypass Stack – Emission Point No.		Bypass Stack Description	

11) LIST OF EMISSION UNITS VENTING THROUGH THIS EMISSION POINT

Emission Unit No.	Emission Unit No	Emission Unit No.	Emission Unit No.
EU3			

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4004. December 24, 2007)

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME CORPORATION			1a) Form INV-5 Page	5	of 5
2) Emission Point No.	EP3	3)	Emission Unit No.	EU3		
4) Calculations are provided in support of information reported on Form INV -	3 ☒	4 ☒	for the Emission Point and Emission Unit listed above.			
5) Emissions Calculations						

Process: Industrial Boiler SCC No. 10200502

Fuel: No. 2 Fuel Oil: 140,000 Btu per gallon, Percent sulfur content = 0.4
Maximum rate: 15 Million Btu/hr, 107 gallons per hour = 0.107 1,000 gallons per hour
Actual Year Throughput - Yearly Total: 5,000 gallons

Pollutant	Emission Factors from FIRE 6.25 (SCC No. 10200502)	
$PM_{2.5}$	1.55 lb per 1,000 gallons burned	
PM_{10}	2.3 lb per 1,000 gallons burned	
SO_2	142 (S) lb per 1,000 gallons burned	S = percent sulfur in fuel
NOx	20.0 lb per 1,000 gallons burned	
VOC	0.2 lb per 1,000 gallons burned	
CO	5.00 lb per 1,000 gallons burned	
Ammonia	0.8 lb per 1,000 gallons burned	

Calculations

POTENTIAL EMISSIONS:
In order for the calculation to work, the design capacity units of measure have to cancel with the emission factor units of measure to obtain a pound per hour value. Since the emission factor units of measure are in pounds per 1,000 gallons, the maximum design rate must be in 1,000 gallons per hour.

Potential $PM_{2.5}$ tons/yr
(0.107 1,000 gal/hr) *x* (1.55 lb/1,000 gal) *x* (8,760 hr/yr) *x* (1 ton/2,000 lb) = 0.73

Potential SO_2 tons/yr
(0.107 1,000 gal/hr) *x* [142 (0.4 % sulfur) lb/1,000 gal] *x* (8,760 hr/yr) *x* (1 ton/2,000 lb) = 26.62

Potential PM_{10} tons/yr = 1.08
Potential NOx tons/yr = 9.37
Potential VOC tons/yr = 0.09
Potential CO tons/yr = 2.34
Potential Ammonia tons/yr = 0.37

ACTUAL ANNUAL EMISSIONS:
Actual $PM_{2.5}$ tons
(5 1,000 gal) *x* (1.55 lb/1,000 gal) *x* (1 ton/2,000 lb) = 0.00

Actual SO_2 tons
(5 1,000 gal) *x* [142 (0.4 % sulfur) lb/1,000 gal] *x* (1 ton/2,000 lb) = 0.14

Actual PM_{10} tons = 0.01
Actual NOx tons = 0.05
Actual VOC tons = 0.00
Actual CO tons = 0.01
Actual Ammonia tons = 0.00

Form INV-3 EMISSION UNIT DESCRIPTION – POTENTIAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME CORPORATION	1a) Form INV-3 Page	3	of	3	
2)	Emission Point Number	EP3					

EMISSION UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

3)	Emission Unit Number	EU3					
4)	SCC Number	10200502					
5)	Description of Process	NO. 2 FUEL OIL COMBUSTION					
6)	Date of Construction	10/30/1985	7) Date of Installation	10/30/1985	8)	Date of Modification	
9)	Raw Material – OR Fuels Used List worst case for EACH pollutant	NO. 2 FUEL OIL					
10)	Federally Enforceable Limit						
11)	Permit or Rule Establishing Limit						
12)	Maximum Hourly Design Rate	0.107	1,000 GALLONS		Per Hour		

13) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

POTENTIAL EMISSIONS

14 Air Pollutant	15 Emission Factor	16 Emission Factor Units	17 Source of Emission Factor	18 Ash or Sulfur %	19 Potential Hourly Uncontrolled Emissions (Lbs/Hr)	20 Combined Control Efficiency	21 Transfer Efficiency	22 Potential Hourly Controlled Emissions (Lbs/Hr)	23 Potential Annual Emissions (Tons/Yr)
PM-2.5	1.55	LB/1,000 GAL	WEBFIRE		0.17				0.73
PM-10	2.3	LB/1,000 GAL	WEBFIRE		0.25				1.08
SO_2	142	LB/1,000 GAL	WEBFIRE	0.4	6.08				26.62
NOx	20.0	LB/1,000 GAL	WEBFIRE		2.14				9.37
VOC	0.2	LB/1,000 GAL	WEBFIRE		0.02				0.09
CO	5.0	LB/1,000 GAL	WEBFIRE		0.54				2.34
Lead									
Ammonia	0.80	LB/1000 GAL	WEBFIRE		0.09				0.37
POTENTIAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 14									

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4001. December 24, 2007)

Form INV-4 EMISSION UNIT DESCRIPTION – ACTUAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME CORPORATION		1a) Form INV-4 Page	3	of	3
2)	Emission Year	2008	3) Emission Point Number	EP3			

EMISSION UNIT – ACTUAL OPERATIONS AND EMISSIONS

4)	Emission Unit Number	EU3	5) SCC Number	10200502
6)	Description of Process	NO. 2 FUEL OIL COMBUSTION		

ACTUAL THROUGHPUT

7)	Raw Material	NO. 2 FUEL OIL			
8)	Actual Throughput – Yearly Total	5	9)	Units Raw Material	1,000 GALLONS

Actual Operating Rate/Schedule

	10) Percent of Total Operating Time	11) Hours/Day	12) Days/Week	13) Weeks/Quarter
JAN – MAR	35	24	7	13
APR – JUN	15	24	7	6
JUL – SEP	15	24	7	6
OCT - DEC	35	24	7	13

14) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

ACTUAL EMISSIONS

15 Air Pollutant	16 Emission Factor	17 Emission Factor Units	18 Source of Emission Factor	19 Ash or Sulfur %	20 Combined Control Efficiency	21 Transfer Efficiency	22 Actual Emissions (Tons/Yr)
PM-2.5	1.55	LB/1,000 GAL	WEBFIRE				0.00
PM-10	2.3	LB/1,000 GAL	WEBFIRE				0.01
SO_2	142	LB/1,000 GAL	WEBFIRE	0.4			0.14
NOX	20.0	LB/1,000 GAL	WEBFIRE				0.05
VOC	0.2	LB/1,000 GAL	WEBFIRE				0.00
CO	5.0	LB/1,000 GAL	WEBFIRE				0.01
Lead							
Ammonia	0.80	LB/1,000 GAL	WEBFIRE				0.00
ACTUAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 15							

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4002 December 24, 2007)

AIR QUALITY BUREAU
7900 Hickman Rd., Suite 1
Urbandale, IA 50322

IOWA DNR Minor Source Emission Inventory

Form INV-1 Facility Identification

1) Application Type	Initial ☒	Supplemental Information ☐	
2) Facility Number	##-05-025		
3) Company/Facility Name	ACME HOSPTIAL		
4) Emission Year	2008		
5) Facility Street Address	222 N 2ND ST		
6) Facility City	ANYTOWN		IA
7) Zip Code	55555		
8) Facility Contact Person	DAVID SMITH		
9a) Facility Contact Phone Number	515-555-5555		
9b) Facility Contact E-mail Address	dsmith@emailacmecorp		
10) Mailing Street/PO Box	PO BOX 123		
11) Mailing City	ANYTOWN		
12) State	IA		
13) Zip Code	55555		
14) Parent Company / Owner Name			
15) Parent Company / Owner Mailing Address			
16) City			
17) State			
18) Zip Code			
19) Parent Company Contact/Agent			
20) Parent Company Contact Phone Number			
21) Standard Industrial Classification (SIC)	8062		
22) Activity Description	General medical and surgical hospitals		
23) SECONDARY ACTIVITIES			
SIC			
Activity Description			
SIC			
Activity Description			
24) PLANT LOCATION			
Latitude	41.605621		
Longitude	-93.588353		

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4000. December 24, 2007)

Form INV-2 EMISSION POINT DESCRIPTION

Duplicate this form for EACH Emission POINT

1) Company/Facility Name	ACME HOSPITAL	1a) Form INV-2 Page	1	of	4
2) Emission Point Number	EP4				
3) Emission Point Description	BOILER STACK				
4) Is this stack/vent used as an Emergency Bypass Stack?	No ☒	Yes ☐			
If YES, for which stack(s)? List Emission Point Nos.:					

EMISSION POINT INFORMATION

5) Emission Point Type

Stack/Vent	☒	
Fugitive (specify)	☐	
Other (specify)	☐	

6) Stack Shape and Dimensions: (interior dimensions at exit point)

Circular Diameter:	☒	18	inches			
Rectangular Dimensions:	☐		inches	X		inches
Other Dimensions	☐		inches			

7) Stack Height Above Ground	20	feet	

8) Does the Emission Point have a rain cap (or anything else) which obstructs the flow of gases leaving the Emission Point, or a horizontal discharge?

No	☒	YES (specify):	☐	

9) COMPOSTION OF EXHAUST STREAM

Exhaust Stream Characteristics	Emission Point Composition of Exhaust Stream	Units of Measure
a) Flow Rate	3,600	☒ ACFM ☐ SCFM
b) Temperature	300	Degree Fahrenheit

10) BYPASS STACKS

Bypass Stack – Emission Point No.		Bypass Stack Description	
Bypass Stack – Emission Point No.		Bypass Stack Description	

11) LIST OF EMISSION UNITS VENTING THROUGH THIS EMISSION POINT

Emission Unit No.	Emission Unit No	Emission Unit No.	Emission Unit No.
EU4			

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4004. December 24, 2007)

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-5 Page	1	of 7
2) Emission Point No.	EP4	3)	Emission Unit No.	EU4		
4) Calculations are provided in support of information reported on Form INV -	3 ☒	4 ☒	for the Emission Point and Emission Unit listed above.			
5) Emissions Calculations						

Process: Industrial Boiler SCC No. 10200602

Fuel: Natural Gas: 1050 Btu/ft^3
Maximum rate: 15 Million Btu/hr, 14,286 ft^3/hr = .014 MMcf/hr
Actual Year Throughput - Yearly Total: 24.5 MMcf

Pollutant	Emission Factors from WebFIRE (SCC No. 10200602)
$PM_{2.5}$	7.6 lb per MMcf burned
PM_{10}	7.6 lb per MMcf burned
SO_2	0.6 lb per MMcf burned
NOx	100 lb per MMcf burned
VOC	5.5 lb per MMcf burned
CO	84 lb per MMcf burned
Ammonia	3.2 lb per MMcf burned
Hexane	1.8 lb per MMcf burned

Calculations

POTENTIAL EMISSIONS:

Potential $PM_{2.5}$ tons/yr
Potential PM_{10} tons/yr
(0.014 MMcf/hr) *x* (7.6 lb/MMcf) *x* (8,760 hr/yr) *x* (1 ton/2,000 lb) = 0.47 tons/yr

Potential SO_2 tons/yr = 0.04
Potential NOx tons/yr = 6.13
Potential VOC tons/yr = 0.34
Potential CO tons/yr = 5.15
Potential Ammonia tons/yr = 0.20
Potential Hexane tons/yr = 0.11

ACTUAL ANNUAL EMISSIONS:
Actual $PM_{2.5}$ tons
Actual PM_{10} tons
(24.5 MMcf) *x* (7.6 lb/MMcf) *x* (1 ton/2000 lb) = 0.09 tons

Actual SO_2 tons = 0.01
Actual NOx tons = 1.23
Actual VOC tons = 0.07
Actual CO tons = 1.03
Actual Ammonia tons = 0.04
Actual Hexane tons = 0.02

Form INV-3 EMISSION UNIT DESCRIPTION – POTENTIAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME HOSPITAL	1a) Form INV-3 Page	1	of	4	
2)	Emission Point Number	EP4					
	EMISSION UNIT (PROCESS) IDENTIFICATION & DESCRIPTION						
3)	Emission Unit Number	EU4					
4)	SCC Number	10200602					
5)	Description of Process	NATURAL GAS COMBUSTION					
6)	Date of Construction	10/30/1985	7) Date of Installation	10/30/1985	8) Date of Modification		
9)	Raw Material – OR Fuels Used List worst case for EACH pollutant	NATURAL GAS					
10)	Federally Enforceable Limit						
11)	Permit or Rule Establishing Limit						
12)	Maximum Hourly Design Rate	0.014	MMCF	Per Hour			
13)	AIR POLLUTION CONTROL EQUIPMENT (CE)						
	Control Equipment Number						
	Control Equipment Description						
	Control Equipment Number						
	Control Equipment Description						

POTENTIAL EMISSIONS

14 Air Pollutant	15 Emission Factor	16 Emission Factor Units	17 Source of Emission Factor	18 Ash or Sulfur %	19 Potential Hourly Uncontrolled Emissions (Lbs/Hr)	20 Combined Control Efficiency	21 Transfer Efficiency	22 Potential Hourly Controlled Emissions (Lbs/Hr)	23 Potential Annual Emissions (Tons/Yr)
PM-2.5	7.6	LB/MCCF	WEBFIRE		0.11				0.47
PM-10	7.6	LB/MMCF	WEBFIRE		0.11				0.47
SO_2	0.6	LB/MMCF	WEBFIRE		0.01				0.04
NOx	100	LB/MMCF	WEBFIRE		1.40				6.13
VOC	5.5	LB/MMCF	WEBFIRE		0.08				0.34
CO	84	LB/MMCF	WEBFIRE		1.18				5.15
Lead									
Ammonia	3.2	LB/MMCF	WEBFIRE		0.04				0.20
POTENTIAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 14									
Hexane	1.8	LB/MMCF	WEBFIRE		0.03				0.11

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4001. December 24, 2007)

Form INV-4 EMISSION UNIT DESCRIPTION – ACTUAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-4 Page	1	of	5
2) Emission Year	2008	3) Emission Point Number		EP4			
EMISSION UNIT – ACTUAL OPERATIONS AND EMISSIONS							
4) Emission Unit Number	EU4		5) SCC Number	10200602			
6) Description of Process	NATURAL GAS COMBUSTION						
ACTUAL THROUGHPUT							
7) Raw Material	NATURAL GAS						
8) Actual Throughput – Yearly Total	24.5	9)	Units Raw Material	MMCF			

Actual Operating Rate/Schedule

	10) Percent of Total Operating Time	11) Hours/Day	12) Days/Week	13) Weeks/Quarter
JAN – MAR	25	8	5	13
APR – JUN	25	8	5	13
JUL – SEP	25	8	5	13
OCT - DEC	25	8	5	13

14) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

ACTUAL EMISSIONS

15 Air Pollutant	16 Emission Factor	17 Emission Factor Units	18 Source of Emission Factor	19 Ash or Sulfur %	20 Combined Control Efficiency	21 Transfer Efficiency	22 Actual Emissions (Tons/Yr)
PM-2.5	7.6	LB/MMCF	WEBFIRE				0.09
PM-10	7.6	LB/MMCF	WEBFIRE				0.09
SO_2	0.6	LB/MMCF	WEBFIRE				0.01
NOX	100	LB/MMCF	WEBFIRE				1.23
VOC	5.5	LB/MMCF	WEBFIRE				0.07
CO	84	LB/MMCF	WEBFIRE				1.03
Lead							
Ammonia	3.2	LB/MMCF	WEBFIRE				0.04
ACTUAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 15							
Hexane	1.8	LB/MMCF	WEBFIRE				0.02

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4002 December 24, 2007)

Form INV-2 EMISSION POINT DESCRIPTION

Duplicate this form for EACH Emission POINT

1) Company/Facility Name	ACME HOSPITAL	1a) Form INV-2 Page	2	of	4
2) Emission Point Number	EP5				
3) Emission Point Description	DIESEL GENERATOR STACK				
4) Is this stack/vent used as an Emergency Bypass Stack?	No ☒	Yes ☐			
If YES, for which stack(s)? List Emission Point Nos.:					

EMISSION POINT INFORMATION

5) Emission Point Type

Stack/Vent	☒
Fugitive (specify)	☐
Other (specify)	☐

6) Stack Shape and Dimensions: (interior dimensions at exit point)

Circular Diameter:	☒	5	inches		
Rectangular Dimensions:	☐		inches	X	inches
Other Dimensions	☐		inches		

7) Stack Height Above Ground	67	feet

8) Does the Emission Point have a rain cap (or anything else) which obstructs the flow of gases leaving the Emission Point, or a horizontal discharge?

No	☒	YES (specify):	☐	

9) COMPOSTION OF EXHAUST STREAM

Exhaust Stream Characteristics	Emission Point Composition of Exhaust Stream	Units of Measure
a) Flow Rate	7,795	☒ ACFM ☐ SCFM
b) Temperature	400	Degree Fahrenheit

10) BYPASS STACKS

Bypass Stack – Emission Point No.		Bypass Stack Description	
Bypass Stack – Emission Point No.		Bypass Stack Description	

11) LIST OF EMISSION UNITS VENTING THROUGH THIS EMISSION POINT

Emission Unit No.	Emission Unit No	Emission Unit No.	Emission Unit No.
EU5			

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4004. December 24, 2007)

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-5 Page	2	of	7
2) Emission Point No.	EP5	3)	Emission Unit No.	EU5			
4) Calculations are provided in support of information reported on Form INV -	3 ☒	4 ☒	for the Emission Point and Emission Unit listed above.				
5) Emissions Calculations							

Process: Diesel Generator < 600 BHP SCC No. 20200102

Fuel: Diesel Fuel
Maximum rate: 119.29 gallons/hr, 0.140 MMBtu/gallon = 16.7 MMBtu/hr
Actual Year Throughput - Yearly Total: 1,000 gallons, 0.140 MMBtu/gallon = 140 MMBtu

Pollutant	Emission Factors from AP-42 (SCC No. 20200102)
$PM_{2.5}$	0.31 lb per MMBtu burned (Note: Per WebFIRE, $PM_{2.5}$ = PM_{10} = PM for SCC 20200102)
PM_{10}	0.31 lb per MMBtu burned
SO_2	0.29 lb per MMBtu burned
NOx	4.41 lb per MMBtu burned
VOC	0.35 lb per MMBtu burned
CO	0.95 lb per MMBtu burned

Calculations

POTENTIAL EMISSIONS:

Note: *The potential to emit for most generators can be calculated using an operating limit of 500 hours/year if the generator meets the following definition of potential to emit from 567 IAC 22.100:*

…For the purposes of calculating potential to emit for emergency generators, "maximum capacity" means one of the following:

- *500 hours of operation annually, if the generator has actually been operated less than 500 hours per year for the past five years;*
- *8,760 hours of operation annually, if the generator has actually been operated more than 500 hours in one of the past five years; or*
- *The number of hours specified in a state or federally enforceable limit.*

Potential $PM_{2.5}$ tons/yr
Potential PM_{10} tons/yr
(16.7 MMBtu/hr) *x* (0.31 lb/MMBtu) = 5.177 lb/hr *x* (500 hours/year) *x* (1 ton/2,000 lb) = 1.29 tons/yr

Potential SO_2 tons/yr = 1.21
Potential NOx tons/yr = 18.41
Potential VOC tons/yr = 1.46
Potential CO tons/yr = 3.97

ACTUAL ANNUAL EMISSIONS:

Actual $PM_{2.5}$ tons
Actual PM_{10} tons
(140 MMBtu) *x* (0.31 lb/MMBtu) *x* (1 ton/2,000 lb) = 0.02 tons

Actual SO_2 tons = 0.02
Actual NOx tons = 0.31
Actual VOC tons = 0.02
Actual CO tons = 0.07

Form INV-3 EMISSION UNIT DESCRIPTION – POTENTIAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME HOSPITAL	1a) Form INV-3 Page	2	of	4	
2)	Emission Point Number	EP5					

EMISSION UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

3)	Emission Unit Number	EU5						
4)	SCC Number	20200102						
5)	Description of Process	DIESEL FUEL COMBUSTION < 600 BHP						
6)	Date of Construction	6/1/85	7)	Date of Installation	6/1/85	8)	Date of Modification	
9)	Raw Material – OR Fuels Used List worst case for EACH pollutant	DIESEL FUEL						
10)	Federally Enforceable Limit	500 HOURS/YEAR						
11)	Permit or Rule Establishing Limit	567 IAC 22.100						
12)	Maximum Hourly Design Rate	16.7	MMBTU					Per Hour

13) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

POTENTIAL EMISSIONS

14 Air Pollutant	15 Emission Factor	16 Emission Factor Units	17 Source of Emission Factor	18 Ash or Sulfur %	19 Potential Hourly Uncontrolled Emissions (Lbs/Hr)	20 Combined Control Efficiency	21 Transfer Efficiency	22 Potential Hourly Controlled Emissions (Lbs/Hr)	23 Potential Annual Emissions (Tons/Yr)
PM-2.5	0.31	LB/MMBTU	WebFIRE		5.18				1.29
PM-10	0.31	LB/MMBTU	AP-42		5.18				1.29
SO_2	0.29	LB/MMBTU	AP-42		4.84				1.21
NOx	4.41	LB/MMBTU	AP-42		73.65				18.41
VOC	0.35	LB/MMBTU	AP-42		5.85				1.46
CO	0.95	LB/MMBTU	AP-42		15.87				3.97
Lead									
Ammonia									
POTENTIAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 14									

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4001. December 24, 2007)

Form INV-4 EMISSION UNIT DESCRIPTION – ACTUAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME HOSPITAL		1a) Form INV-4 Page	2	of	5
2)	Emission Year	2008	3) Emission Point Number	EP5			

EMISSION UNIT – ACTUAL OPERATIONS AND EMISSIONS

4)	Emission Unit Number	EU5	5) SCC Number	20200102
6)	Description of Process	DIESEL COMBUSTION < 600 HP		

ACTUAL THROUGHPUT

7)	Raw Material	DIESEL FUEL		
8)	Actual Throughput – Yearly Total	140	9) Units Raw Material	MMBTU

Actual Operating Rate/Schedule

	10) Percent of Total Operating Time	11) Hours/Day	12) Days/Week	13) Weeks/Quarter
JAN – MAR	23.5	1	1	2
APR – JUN	23.5	1	1	2
JUL – SEP	23.5	1	1	2
OCT - DEC	29.4	1.25	1	2

14) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

ACTUAL EMISSIONS

15 Air Pollutant	16 Emission Factor	17 Emission Factor Units	18 Source of Emission Factor	19 Ash or Sulfur %	20 Combined Control Efficiency	21 Transfer Efficiency	22 Actual Emissions (Tons/Yr)
PM-2.5	0.31	LB/MMBTU	WebFIRE				0.02
PM-10	0.31	LB/MMBTU	AP-42				0.02
SO_2	0.29	LB/MMBTU	AP-42				0.02
NOX	4.41	LB/MMBTU	AP-42				0.31
VOC	0.35	LB/MMBTU	AP-42				0.02
CO	0.95	LB/MMBTU	AP-42				0.07
Lead							
Ammonia							
ACTUAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 15							

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4002 December 24, 2007)

Form INV-2 EMISSION POINT DESCRIPTION

Duplicate this form for EACH Emission POINT

1) Company/Facility Name	ACME HOSPTIAL	1a) Form INV-2 Page	3	of	4
2) Emission Point Number	EP6				
3) Emission Point Description	DIESEL GENERATOR STACK				
4) Is this stack/vent used as an Emergency Bypass Stack?	No ☒	Yes ☐			
If YES, for which stack(s)? List Emission Point Nos.:					

EMISSION POINT INFORMATION

5) Emission Point Type

Stack/Vent	☒
Fugitive (specify)	☐
Other (specify)	☐

6) Stack Shape and Dimensions: (interior dimensions at exit point)

Circular Diameter:	☒	5	inches		
Rectangular Dimensions:	☐		inches	X	inches
Other Dimensions	☐		inches		

7) Stack Height Above Ground	67	feet

8) Does the Emission Point have a rain cap (or anything else) which obstructs the flow of gases leaving the Emission Point, or a horizontal discharge?

No	☒	YES (specify):	☐

9) COMPOSTION OF EXHAUST STREAM

Exhaust Stream Characteristics	Emission Point Composition of Exhaust Stream	Units of Measure
a) Flow Rate	7,795	☒ ACFM ☐ SCFM
b) Temperature	400	Degree Fahrenheit

10) BYPASS STACKS

Bypass Stack – Emission Point No.		Bypass Stack Description	
Bypass Stack – Emission Point No.		Bypass Stack Description	

11) LIST OF EMISSION UNITS VENTING THROUGH THIS EMISSION POINT

Emission Unit No.	Emission Unit No	Emission Unit No.	Emission Unit No.
EU6			

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4004. December 24, 2007)

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-5 Page	3	of	7
2) Emission Point No.	EP6	3)	Emission Unit No.	EU6			
4) Calculations are provided in support of information reported on Form INV -	3 ☒	4 ☒	for the Emission Point and Emission Unit listed above.				
5) Emissions Calculations							

Process: Diesel Generator > 600 BHP SCC No. 20200401
Fuel: Diesel Fuel
Maximum rate: 226.9 gallons/hr, 0.140 MMBtu/gallon = 31.77 MMBtu/hr
Actual Year Throughput - Yearly Total: 1,900 gallons, 0.140 MMBtu/gallon = 266 MMBtu

Pollutant	Emission Factor from WebFIRE (SCC No. 20200401)
$PM_{2.5}$	7.55 lb/1,000 gallons or 0.05 lb/MMBtu

Pollutant	Emission Factors from DNR Memo. This emission factor is an Iowa emission factor. It is based on stack tests performed in the state. An emission factor rating has not been determined.
PM_{10}	0.14 lb per MMBtu burned

Pollutant	Emission Factors from AP-42 (SCC No. 20200401)	
SO_2	1.01(S) lb per MMBtu burned	S = percent sulfur in fuel
NOx	3.2 lb per MMBtu burned	
VOC	0.09 lb per MMBtu burned	
CO	0.85 lb per MMBtu burned	

Calculations

POTENTIAL EMISSIONS:

Note: *The potential to emit for most generators can be calculated using an operating limit of 500 hours/year if the generator meets the following definition of potential to emit from 567 IAC 22.100:*

…For the purposes of calculating potential to emit for emergency generators, "maximum capacity" means one of the following:

- *500 hours of operation annually, if the generator has actually been operated less than 500 hours per year for the past five years;*
- *8,760 hours of operation annually, if the generator has actually been operated more than 500 hours in one of the past five years; or*
- *The number of hours specified in a state or federally enforceable limit.*

Potential $PM_{2.5}$ tons/yr
(31.77 MMBtu/hr) *x* (0.05 lb/MMBtu) = 1.59 lb/hr *x* (500 hours/year) *x* (1 ton/2,000 lb) = 0.40 tons/yr

Potential SO_2 tons/yr
(31.77 MMBtu/hr) *x* [1.01 (0.5 % sulfur) lb/MMBtu] *x* (500 hours/year) *x* (1 ton/2,000 lb) = 4.01 tons/yr

Potential PM_{10} tons/yr = 1.11
Potential NOx tons/yr = 25.42
Potential VOC tons/yr = 0.71
Potential CO tons/yr = 6.75

ACTUAL ANNUAL EMISSIONS:
Actual $PM_{2.5}$ tons
(266 MMBtu) *x* (0.05 lb/MMBtu) *x* (1 ton/2000 lb) = 0.01 tons

Actual PM_{10} tons = 0.02
Actual SO_2 tons = 0.07
Actual NOx tons = 0.43
Actual VOC tons = 0.01
Actual CO tons = 0.11

Form INV-3 EMISSION UNIT DESCRIPTION – POTENTIAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME HOSPITAL	1a) Form INV-3	Page	3	of	4
2)	Emission Point Number	EP6					

EMISSION UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

3)	Emission Unit Number	EU6						
4)	SCC Number	20200401						
5)	Description of Process	DIESEL FUEL COMBUSTION > 600 BHP						
6)	Date of Construction	6/1/85	7)	Date of Installation	6/1/85	8)	Date of Modification	
9)	Raw Material – OR Fuels Used List worst case for EACH pollutant	DIESEL FUEL						
10)	Federally Enforceable Limit	500 HOURS/YEAR						
11)	Permit or Rule Establishing Limit	567 IAC 22.100						
12)	Maximum Hourly Design Rate	31.77	MMBTU			Per Hour		

13) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

POTENTIAL EMISSIONS

14 Air Pollutant	15 Emission Factor	16 Emission Factor Units	17 Source of Emission Factor	18 Ash or Sulfur %	19 Potential Hourly Uncontrolled Emissions (Lbs/Hr)	20 Combined Control Efficiency	21 Transfer Efficiency	22 Potential Hourly Controlled Emissions (Lbs/Hr)	23 Potential Annual Emissions (Tons/Yr)
PM-2.5	0.05	LB/MMBTU	WebFIRE		1.59				0.40
PM-10	0.14	LB/MMBTU	DNR Memo		4.45				1.11
SO_2	1.01	LB/MMBTU	AP-42	0.5	16.04				4.01
NOx	3.2	LB/MMBTU	AP-42		101.66				25.42
VOC	0.09	LB/MMBTU	AP-42		2.86				0.71
CO	0.85	LB/MMBTU	AP-42		27.00				6.75
Lead									
Ammonia									
POTENTIAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 14									

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4001. December 24, 2007)

Form INV-4 EMISSION UNIT DESCRIPTION – ACTUAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME HOSPITAL		1a) Form INV-4 Page	3	of	5
2)	Emission Year	2008	3) Emission Point Number	EP6			

EMISSION UNIT – ACTUAL OPERATIONS AND EMISSIONS

4)	Emission Unit Number	EU6	5) SCC Number	20200401
6)	Description of Process	DIESEL COMBUSTION > 600 HP		

ACTUAL THROUGHPUT

7)	Raw Material	DIESEL FUEL			
8)	Actual Throughput – Yearly Total	266	9)	Units Raw Material	MMBTU

Actual Operating Rate/Schedule

	10) Percent of Total Operating Time	11) Hours/Day	12) Days/Week	13) Weeks/Quarter
JAN – MAR	23.5	1	1	2
APR – JUN	23.5	1	1	2
JUL – SEP	23.5	1	1	2
OCT - DEC	29.4	1.25	1	2

14) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

ACTUAL EMISSIONS

15 Air Pollutant	16 Emission Factor	17 Emission Factor Units	18 Source of Emission Factor	19 Ash or Sulfur %	20 Combined Control Efficiency	21 Transfer Efficiency	22 Actual Emissions (Tons/Yr)
PM-2.5	0.05	LB/MMBTU	WebFIRE				0.01
PM-10	0.14	LB/MMBTU	DNR MEMO				0.02
SO_2	1.01	LB/MMBTU	AP-42	0.5			0.07
NOX	3.2	LB/MMBTU	AP-42				0.43
VOC	0.09	LB/MMBTU	AP-42				0.01
CO	0.85	LB/MMBTU	AP-42				0.11
Lead							
Ammonia							
ACTUAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 15							

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4002 December 24, 2007)

Form INV-2 EMISSION POINT DESCRIPTION

Duplicate this form for EACH Emission POINT

1) Company/Facility Name	ACME HOSPITAL	1a) Form INV-2 Page	4	of	4
2) Emission Point Number	EP7				
3) Emission Point Description	DUAL FUEL GENERATOR STACK				
4) Is this stack/vent used as an Emergency Bypass Stack?	No ☒	Yes ☐			
If YES, for which stack(s)? List Emission Point Nos.:					

EMISSION POINT INFORMATION

5) Emission Point Type

Stack/Vent	☒	
Fugitive (specify)	☐	
Other (specify)	☐	

6) Stack Shape and Dimensions: (interior dimensions at exit point)

Circular Diameter:	☒	15	inches			
Rectangular Dimensions:	☐		inches	X		inches
Other Dimensions	☐		inches			

7) Stack Height Above Ground	30	feet

8) Does the Emission Point have a rain cap (or anything else) which obstructs the flow of gases leaving the Emission Point, or a horizontal discharge?

No	☒	YES (specify):	☐	

9) COMPOSTION OF EXHAUST STREAM

Exhaust Stream Characteristics	Emission Point Composition of Exhaust Stream	Units of Measure
a) Flow Rate	4,000	☐ ACFM ☒ SCFM
b) Temperature	500	Degree Fahrenheit

10) BYPASS STACKS

Bypass Stack – Emission Point No.		Bypass Stack Description	
Bypass Stack – Emission Point No.		Bypass Stack Description	

11) LIST OF EMISSION UNITS VENTING THROUGH THIS EMISSION POINT

Emission Unit No.	Emission Unit No	Emission Unit No.	Emission Unit No.
EU7			

Duplicate this form as needed

TYPE ALL INFORMATION

(DNR Form 542-4004. December 24, 2007)

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-5 Page	4	of	7
2) Emission Point No.	EP7	3)	Emission Unit No.	EU7			
4) Calculations are provided in support of information reported on Form INV -	3 ☒	4 ☐	for the Emission Point and Emission Unit listed above.				
5) Emissions Calculations							

Process: Internal Diesel Combustion > 600 BHP SCC No. 20200401

Fuel: Diesel Fuel

Maximum rate: 75 gallons/hr x 0.140 MMBtu/gallon = 10.5 MMBtu/hr

Permit Limits: Diesel fuel or dual fuel usage only, maximum Sulfur content of fuel may not exceed 0.5%, 500 hours of operation per 12 months, 2.50 lbs/hr PM_{10}, 5.50 lbs/hr SO_2, and 50 lbs/hr NO_x.

*Applicable pollutants: PM_{10}, SO_2, and NO_x (these emission factors are higher for internal diesel combustion when compared to dual fuel combustion)

*Pollutants attributed to the dual fuel combustion process: $PM_{2.5}$, VOC, CO, Benzene, Formaldehyde, and Toluene (these emission factors are higher for dual fuel combustion when compared to internal diesel combustion)

*Pollutants exempt from reporting for this process: Acetaldehyde and Acrolein (these emission factors, when combined with the 500 hours of operation per 12 months permit limit, lead to emissions of less than .01 tons/yr)

PM_{10}:

75 gal/hr x 0.140 MMBtu/gal x .14 lbs/MMBtu = 1.47 lbs/hr (hourly-uncontrolled emissions)

The permit limit allows for 2.50 lbs/hr of PM_{10} (hourly-controlled emissions)

2.50 lbs/hr x 500 hrs/yr x 1 ton/2,000lbs = .63 tons/yr (potential annual emissions)

SO_2:

75 gal/hr x 0.140 MMBtu/gal x 1.01 lbs/MMBtu x 0.5 (Sulfur content) = 5.30 lbs/hr (hourly-uncontrolled emissions)

The permit limit allows for 5.50 lbs/hr of SO_2 (hourly-controlled emissions)

5.50 lbs/hr x 500 hrs/yr x 1 ton/2,000lbs = 1.38 tons/yr (potential annual emissions)

NO_x:

75 gal/hr x 0.140 MMBtu/gal x 3.2 lbs/MMBtu = 33.60 lbs/hr (hourly-uncontrolled emissions)

The permit limit allows for 50.00 lbs/hr of NO_x (hourly-controlled emissions)

50.00 lbs/hr x 500 hrs/yr x 1 ton/2,000lbs = 12.50 tons/yr (potential annual emissions)

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-5 Page	5	of	7
2) Emission Point No.	EP7	3)	Emission Unit No.	EU7			
4) Calculations are provided in support of information reported on Form INV -	3 ☒	4 ☐	for the Emission Point and Emission Unit listed above.				
5) Emissions Calculations							

Process: Dual Fuel Combustion > 600 BHP SCC No. 20200402

Fuel: Dual Fuel (95% Natural Gas and 5% Diesel Fuel)

Maximum rate: (9,500 ft^3/hr x .00105 MMBtu/ ft^3) + (3.75 gal/hr x 0.140 MMBtu/gal) = 10.5 MMBtu/hr

Permit Limits: Diesel fuel or dual fuel usage only, maximum Sulfur content of fuel may not exceed 0.5%, 500 hours of operation per 12 months, 2.50 lbs/hr PM_{10}, 5.50 lbs/hr SO_2, and 50 lbs/hr NO_x.

*Applicable pollutants: $PM_{2.5}$, VOC, CO, Benzene, Formaldehyde, and Toluene (these emission factors are higher for dual fuel combustion when compared to internal diesel combustion)

*Pollutants attributed to the internal diesel combustion process: PM_{10}, SO_2, and NO_x (these emission factors are higher for internal diesel combustion when compared to dual fuel combustion)

*Pollutants exempt from reporting for this process: Xylene, Naphthalene, and Styrene (these emission factors, when combined with the 500 hours of operation per 12 months permit limit, lead to emissions of less than .01 tons/yr)

Calculations

$PM_{2.5}$:

[(9,500 ft^3/hr x .00105 MMBtu/ ft^3) + (3.75 gal/hr x 0.140 MMBtu/gal)] *x* .0556 lbs/MMBtu = .58 lbs/hr (hourly-uncontrolled emissions)

[(9,500 ft^3/hr x .00105 MMBtu/ ft^3) + (3.75 gal/hr x 0.140 MMBtu/gal)] *x* .0556 lbs/MMBtu x 500 hrs/yr x 1 ton/2,000 lbs = .15 tons/yr (potential annual emissions)

VOC:

[(9,500 ft^3/hr x .00105 MMBtu/ ft^3) + (3.75 gal/hr x 0.140 MMBtu/gal)] *x* 0.8 lbs/MMBtu = 8.40 lbs/hr (hourly-uncontrolled emissions) *x* 500 hrs/yr x 1 ton/2,000 lbs = 2.10 tons/yr (potential annual emissions)

CO:

[(9,500 ft^3/hr x .00105 MMBtu/ ft^3) + (3.75 gal/hr x 0.140 MMBtu/gal)] *x* 1.16 lbs/MMBtu = 12.18 lbs/hr (hourly-uncontrolled emissions) *x* 500 hrs/yr *x* 1 ton/2,000 lbs = 3.05 tons/yr (potential annual emissions)

Benzene:

[(9,500 ft^3/hr x .00105 MMBtu/ ft^3) + (3.75 gal/hr x 0.140 MMBtu/gal)] x .00445 lbs/MMBtu = .05 lbs/hr (hourly-uncontrolled emissions) *x* 500 hrs/yr x 1 ton/2,000 lbs = .01 tons/yr (potential annual emissions)

Formaldehyde:

[(9,500 ft^3/hr x .00105 MMBtu/ ft^3) + (3.75 gal/hr x 0.140 MMBtu/gal)] *x* .0054 lbs/MMBtu = .06 lbs/hr (hourly-uncontrolled emissions) *x* 500 hrs/yr x 1 ton/2,000 lbs = .01 tons/yr (potential annual emissions)

Toluene:

[(9,500 ft^3/hr x .00105 MMBtu/ ft^3) + (3.75 gal/hr x 0.140 MMBtu/gal)] *x* .00523 lbs/MMBtu = .05 lbs/hr (hourly-uncontrolled emissions) *x* 500 hrs/yr x 1 ton/2,000 lbs = .01 tons/yr (potential annual emissions)

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-5 Page	6	of	7
2) Emission Point No.	EP7	3)	Emission Unit No.	EU7			
4) Calculations are provided in support of information reported on Form INV -	3 ☐	4 ☒	for the Emission Point and Emission Unit listed above.				
5) Emissions Calculations							

Process: Internal Diesel Combustion > 600 BHP SCC No. 20200401

Fuel: Diesel Fuel

Actual Throughput: 15,000 gallons x 0.140 MMBtu/gallon = 2,100 MMBtu

*Applicable pollutants: $PM_{2.5}$, PM_{10}, SO_2, NO_x, VOC, CO, Benzene, Formaldehyde, and Toluene (these pollutants have potential emissions of greater than .01 tons/yr for this generator)

*Pollutants exempt from reporting for this process: Xylene, Naphthalene, Acetaldehyde and Acrolein (these emission factors, when combined with the 500 hours of operation per 12 months permit limit, lead to emissions of less than .01 tons/yr)

$PM_{2.5}$:

15,000 gal x 0.140 MMBtu/gal x .05 lbs/MMBtu x 1ton/2,000 lbs = .05 tons

PM_{10}:

15,000 gal x 0.140 MMBtu/gal x .14 lbs/MMBtu x 1ton/2,000 lbs = .15 tons

SO_2:

15,000 gal x 0.140 MMBtu/gal x 1.01 lbs/MMBtu x 0.5 (Sulfur content) x 1ton/2,000 lbs = .53 tons

NO_x:

15,000 gal x 0.140 MMBtu/gal x 3.2 lbs/MMBtu x 1ton/2,000 lbs = 3.36 tons

VOC:

15,000 gal x 0.140 MMBtu/gal x .09 lbs/MMBtu x 1ton/2,000 lbs = .09 tons

CO:

15,000 gal x 0.140 MMBtu/gal x .85 lbs/MMBtu x 1ton/2,000 lbs = .89 tons

Benzene:

15,000 gal x 0.140 MMBtu/gal x .000776 lbs/MMBtu x 1ton/2,000 lbs = .00 tons

Formaldehyde:

15,000 gal x 0.140 MMBtu/gal x .0000789 lbs/MMBtu x 1ton/2,000 lbs = .00 tons

Toluene:

15,000 gal x 0.140 MMBtu/gal x .000281 lbs/MMBtu x 1ton/2,000 lbs = .00 tons

Form INV-5 CALCULATIONS

Duplicate this form for each Form it will accompany in the Questionnaire

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-5 Page	7	of	7
2) Emission Point No.	EP7	3)	Emission Unit No.	EU7			
4) Calculations are provided in support of information reported on Form INV -	3 ☐	4 ☒	for the Emission Point and Emission Unit listed above.				
5) Emissions Calculations							

Process: Dual Fuel Combustion > 600 BHP SCC No. 20200402

Fuel: Dual Fuel (95% Natural Gas and 5% Diesel Fuel)

Actual Throughput: (1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal) = 2,100 MMBtu

*Applicable pollutants: $PM_{2.5}$, PM_{10}, SO_2, NO_x, VOC, CO, Benzene, Formaldehyde, and Toluene (these pollutants have potential emissions of greater than .01 tons/yr for this generator)

*Pollutants exempt from reporting for this process: Xylene, Naphthalene, and Styrene (these emission factors, when combined with the 500 hours of operation per 12 months permit limit, lead to emissions of less than .01 tons/yr)

Calculations

$PM_{2.5}$:

[(1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal)] x .0556 lbs/MMBtu x 1 ton/2,000 lbs = .06 tons

PM_{10}:

[(1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal)] x .0573 lbs/MMBtu x 1 ton/2,000 lbs = .06 tons

SO_2:

[(1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal)] x .05 lbs/MMBtu x 0.5 (Sulfur content) x 1 ton/2,000 lbs = .05 tons

NO_x:

[(1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal)] x 2.7 lbs/MMBtu x 1 ton/2,000 lbs = 2.84 tons

VOC:

[(1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal)] x 0.8 lbs/MMBtu x 1 ton/2,000 lbs = .84 tons

CO:

[(1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal)] x 1.16 lbs/MMBtu x 1 ton/2,000 lbs = 1.22 tons

Benzene:

[(1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal)] x .00445 lbs/MMBtu x 1 ton/2,000 lbs = .00 tons

Formaldehyde:

[(1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal)] x .0054 lbs/MMBtu x 1 ton/2,000 lbs = .01 tons

Toluene:

[(1,900,000 ft^3 x .00105 MMBtu/ft^3) + (750 gal x 0.140 MMBtu/gal)] x .00523 lbs/MMBtu x 1 ton/2,000 lbs = .01 tons

Form INV-3 EMISSION UNIT DESCRIPTION – POTENTIAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME HOSPITAL	1a) Form INV-3 Page	4	of	5	
2)	Emission Point Number	EP7					
	EMISSION UNIT (PROCESS) IDENTIFICATION & DESCRIPTION						
3)	Emission Unit Number	EU7					
4)	SCC Number	20200401					
5)	Description of Process	INTERNAL DIESEL COMBUSTION					
6)	Date of Construction	6-15-94	7) Date of Installation	6-30-94	8) Date of Modification		
9)	Raw Material – OR Fuels Used List worst case for EACH pollutant	DIESEL FUEL					
10)	Federally Enforceable Limit	Diesel/dual fuel use only, 0.5% maximum Sulfur content, 500 hrs/yr					
11)	Permit or Rule Establishing Limit	85-A-000					
12)	Maximum Hourly Design Rate	10.5	MMBTU	Per Hour			
13)	AIR POLLUTION CONTROL EQUIPMENT (CE)						
	Control Equipment Number						
	Control Equipment Description						
	Control Equipment Number						
	Control Equipment Description						

POTENTIAL EMISSIONS

14 Air Pollutant	15 Emission Factor	16 Emission Factor Units	17 Source of Emission Factor	18 Ash or Sulfur %	19 Potential Hourly Uncontrolled Emissions (Lbs/Hr)	20 Combined Control Efficiency	21 Transfer Efficiency	22 Potential Hourly Controlled Emissions (Lbs/Hr)	23 Potential Annual Emissions (Tons/Yr)
PM-2.5									
PM-10	.14	LB/MMBTU	DNR MEMO		1.47			2.50	0.63
SO_2	1.01	LB/MMBTU	AP-42	0.5	5.30			5.50	1.38
NOx	3.2	LB/MMBTU	AP-42		33.60			50.00	12.50
VOC									
CO									
Lead									
Ammonia									
POTENTIAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 14									

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4001. December 24, 2007)

Form INV-3 EMISSION UNIT DESCRIPTION – POTENTIAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1)	Company/Facility Name	ACME HOSPITAL	1a) Form INV-3 Page	5	of	5	
2)	Emission Point Number	EP7					
	EMISSION UNIT (PROCESS) IDENTIFICATION & DESCRIPTION						
3)	Emission Unit Number	EU7					
4)	SCC Number	20200402					
5)	Description of Process	DUAL FUEL COMBUSTION					
6)	Date of Construction	6-15-94	7) Date of Installation	6-30-94	8) Date of Modification		
9)	Raw Material – OR Fuels Used List worst case for EACH pollutant	DUAL FUEL (95% NATURAL GAS, 5% DIESEL FUEL)					
10)	Federally Enforceable Limit	Diesel/dual fuel use only, 0.5% maximum Sulfur content, 500 hrs/yr					
11)	Permit or Rule Establishing Limit	85-A-000					
12)	Maximum Hourly Design Rate	10.5	MMBTU	Per Hour			
13)	AIR POLLUTION CONTROL EQUIPMENT (CE)						
	Control Equipment Number						
	Control Equipment Description						
	Control Equipment Number						
	Control Equipment Description						

POTENTIAL EMISSIONS

14 Air Pollutant	15 Emission Factor	16 Emission Factor Units	17 Source of Emission Factor	18 Ash or Sulfur %	19 Potential Hourly Uncontrolled Emissions (Lbs/Hr)	20 Combined Control Efficiency	21 Transfer Efficiency	22 Potential Hourly Controlled Emissions (Lbs/Hr)	23 Potential Annual Emissions (Tons/Yr)
PM-2.5	.0556	LB/MMBTU	FIRE 6.25		.58				.15
PM-10									
SO_2									
NOx									
VOC	0.8	LB/MMBTU	AP-42		8.40				2.10
CO	1.16	LB/MMBTU	AP-42		12.18				3.05
Lead									
Ammonia									
POTENTIAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 14									
Benzene	.00445	LB/MMBTU	AP-42		.05				.01
Formaldehyde	.0054	LB/MMBTU	AP-42		.06				.01
Toluene	.00523	LB/MMBTU	AP-42		.05				.01

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4001. December 24, 2007)

Form INV-4 EMISSION UNIT DESCRIPTION – ACTUAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-4 Page	4	of	5
2) Emission Year	2008	3) Emission Point Number		EP7			
EMISSION UNIT – ACTUAL OPERATIONS AND EMISSIONS							
4) Emission Unit Number	EU7		5) SCC Number	20200401			
6) Description of Process	INTERNAL DIESEL COMBUSTION						
ACTUAL THROUGHPUT							
7) Raw Material	DIESEL FUEL						
8) Actual Throughput – Yearly Total	2,100	9)	Units Raw Material	MMBTU			

Actual Operating Rate/Schedule

	10) Percent of Total Operating Time	11) Hours/Day	12) Days/Week	13) Weeks/Quarter
JAN – MAR	10	1	4	5
APR – JUN	40	4	4	5
JUL – SEP	40	4	4	5
OCT - DEC	10	1	4	5

14) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

ACTUAL EMISSIONS

15 Air Pollutant	16 Emission Factor	17 Emission Factor Units	18 Source of Emission Factor	19 Ash or Sulfur %	20 Combined Control Efficiency	21 Transfer Efficiency	22 Actual Emissions (Tons/Yr)
PM-2.5	.05	LB/MMBTU	WebFIRE				.05
PM-10	.14	LB/MMBTU	DNR MEMO				.15
SO_2	1.01	LB/MMBTU	AP-42	0.5			.53
NOX	3.2	LB/MMBTU	AP-42				3.36
VOC	.09	LB/MMBTU	AP-42				.09
CO	.85	LB/MMBTU	AP-42				.89
Lead							
Ammonia							
ACTUAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 15							
Benzene	.000776	LB/MMBTU	AP-42				.00
Formaldehyde	.0000789	LB/MMBTU	AP-42				.00
Toluene	.000281	LB/MMBTU	AP-42				.00

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4002 December 24, 2007)

Form INV-4 EMISSION UNIT DESCRIPTION – ACTUAL EMISSIONS

Duplicate this form for EACH Emission UNIT

1) Company/Facility Name	ACME HOSPITAL			1a) Form INV-4 Page	5	of	5
2) Emission Year	2008	3) Emission Point Number		EP7			
EMISSION UNIT – ACTUAL OPERATIONS AND EMISSIONS							
4) Emission Unit Number	EU7		5) SCC Number	20200402			
6) Description of Process	DUAL FUEL COMBUSTION						
ACTUAL THROUGHPUT							
7) Raw Material	DUAL FUEL (95% NATURAL GAS, 5% DIESEL FUEL)						
8) Actual Throughput – Yearly Total	2,100	9)	Units Raw Material	MMBTU			

Actual Operating Rate/Schedule

	10) Percent of Total Operating Time	11) Hours/Day	12) Days/Week	13) Weeks/Quarter
JAN – MAR	10	1	4	5
APR – JUN	40	4	4	5
JUL – SEP	40	4	4	5
OCT - DEC	10	1	4	5

14) AIR POLLUTION CONTROL EQUIPMENT (CE)

Control Equipment Number	
Control Equipment Description	
Control Equipment Number	
Control Equipment Description	

ACTUAL EMISSIONS

15 Air Pollutant	16 Emission Factor	17 Emission Factor Units	18 Source of Emission Factor	19 Ash or Sulfur %	20 Combined Control Efficiency	21 Transfer Efficiency	22 Actual Emissions (Tons/Yr)
PM-2.5	.0556	LB/MMBTU	WebFIRE				.06
PM-10	.0573	LB/MMBTU	WebFIRE				.06
SO_2	.05	LB/MMBTU	AP-42	0.5			.03
NOX	2.7	LB/MMBTU	AP-42				2.84
VOC	0.8	LB/MMBTU	AP-42				.84
CO	1.16	LB/MMBTU	AP-42				1.22
Lead							
Ammonia							
ACTUAL EMISSIONS – Individual HAPs and additional regulated air pollutants – list each individual pollutant name in Column 15							
Benzene	.00445	LB/MMBTU	AP-42				.00
Formaldehyde	.0054	LB/MMBTU	AP-42				.01
Toluene	.00523	LB/MMBTU	AP-42				.01

*Sources of Emission Factors: CEM .. Stack Test .. Mass Balance .. AP-42 .. WebFIRE.. TANKS.. EPA-L&E .. Worksheet .. Other – Specify

Duplicate this form as needed TYPE ALL INFORMATION (DNR Form 542-4002 December 24, 2007)

Appendices

APPENDIX A
Air Quality Glossary

ACFM Actual cubic feet per minute. A measurement of exhaust rate from an emission point.
Act refers to the 1990 Clean Air Act Amendments
Actual Emissions are the actual rate of emissions of a pollutant from an emission unit calculated using the emission unit's actual operating hours, production rates, and types of materials processed, stored, or combusted for the calendar year.
Actual Throughput is the quantity of raw material processed, handled, or used in an emission unit, such as fuels, solvents, coatings, or quantity of dust producing material processed, handled, or transferred.
Air Pollutant is generally any substance in the air not part of the naturally occurring makeup of ambient air or that occurs in unnatural concentrations. In Iowa, this usually refers to hazardous air pollutants and criteria air pollutants.
Allowable Emissions are the emissions rate that represents a limit on the emissions that can occur from an emissions unit. This limit may be based on a federal, state, or local regulatory emission limit determined from state or local regulations and/or 40 Code of Federal Regulations (CFR).
Ambient Standards limit the concentration of a given pollutant in the ambient air. Ambient standards are not emissions limitations on sources, but usually result in such limits being placed on source operation as part of a control strategy to achieve or maintain an ambient standard.
Ammonia is a colorless gas with a very distinct odor. Ammonia emissions are important to air quality analyses because ammonia is involved in the formation of sulfate and nitrate, which are precursors for $PM_{2.5}$. Only primary ammonia needs to be reported. Primary ammonia means it is in the same chemical form as when it was emitted into the atmosphere. Secondary ammonia, such as ammonium sulfate and ammonium nitrate, is formed by chemical reactions in the atmosphere.
Area Sources are smaller sources that do not qualify as point sources under the relevant emissions cutoffs. Area sources encompass more widespread sources that may be abundant, but that, individually, release small amounts of a given pollutant. These are sources for which emissions are estimated as a group rather than individually. Examples typically include dry cleaners, residential wood heating, auto body painting, and consumer solvent use. Area sources generally are not required to submit individual emission estimates.
Attainment Area is an area considered to have air quality as good as or better than the National Ambient Air Quality Standards (NAAQS) as defined in the Act. An area may be in attainment for one or more pollutants but be a nonattainment area for one or more other pollutants.
Bottleneck: A physical or operational limitation that is part of the design of the facility or emission unit. Bottlenecks prevent operation of the equipment at 100% of capacity, and can only be used in limiting potential to emit if part of a federally enforceable permit.
Capture Efficiency is the percentage of pollutant emitted from an emission unit that is caught or captured by a pickup hood or other collection mechanism. An example is a fume hood.
Carbon Monoxide (CO) is a colorless, odorless gas that depletes the oxygen-carrying capacity of blood. Major sources of CO emissions include industrial boilers, incinerators, and motor vehicles.
CAS Number refers to the Chemical Abstract Services number. CAS numbers are often found on Material Safety Data Sheets.
CFR is the Code of Federal Regulations. This is a book of rules published by the federal government. Title 40 of the CFR pertains to Protection of the Environment.
Continuous Emissions Monitoring Equipment that measures the concentration or emission rate of a gas or particulate matter using analyzer measurements and a conversion equation, graph, or computer program. Installation and operation of a CEM may be required by EPA or DNR in order to determine compliance with specific standards. Operation of a CEM must meet performance specifications, certification procedures, and recordkeeping and reporting requirements as specified in applicable regulations.

Construction Permits are permits required before installing or altering equipment or control equipment, with a goal of prevention of significant deterioration or degrading of clean air areas from new industrial development or expansion.
Control Efficiency is the emission reduction efficiency, and is a percentage value representing the amount of an emission unit's emissions that are controlled by a control device.
Criteria Pollutant refers to a pollutant for which a National Ambient Air Quality Standard has been set. Criteria pollutants are carbon monoxide, lead, nitrogen oxides, ozone, particulate matter with aerodynamic diameter less than or equal to 10 micrometers, and sulfur oxides.
Dual Fuel refers to fuel burned at a ratio of 95% natural gas and 5% diesel fuel.
Emergency Generator …any generator of which the sole function is to provide emergency backup power during an interruption of electrical power from the electrical utility. An emergency generator does not include: peaking units at electrical utilities, generators at industrial facilities that typically operate at low rates, but are not confined to emergency purposes; or any standby generators that are used during time periods when power is available from the electric utility. An emergency is an unforeseeable condition that is beyond the control of the owner or operator.
Emission means pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys; and from motor vehicle, locomotive, aircraft, or other nonroad engines.
Emission Factors The relationship between the amount of pollution produced and the amount of raw material processed. For example – pounds of CO_2 per ton of coal fired.
Emission Inventory is a listing, by source, of the amount of air pollutants discharged into the atmosphere of a community.
Emission Limits are limits on emissions that may be federally enforceable and exist in a permit. Such limits are usually expressed as a rate, generally in pounds per hour of emissions or as a concentration such as grains per dry standard cubic foot (7,000 grains is one pound).
Emission Point is the point where emissions enter the atmosphere such as stacks, vents and ventilation exhausts.
Emission Unit is a piece of equipment where emissions are generated. Emission units may have one or more processes with the potential to emit air pollutants. Some examples of an emission unit with one or more processes are boilers (the ability to burn both natural gas and fuel oil), generators (the ability to burn both fuel oil and dual fuel), and grain dryers (the ability to dry grain and burn natural gas).
Engineering Estimate is a term commonly applied to the best approximation that can be made when the specific emission estimation techniques such as stack testing, material balance, or emission factors are not possible. This estimation is usually made by an engineer familiar with the specific process, and is based on process information.
Greenhouse Gas Any gas that absorbs and re-emits infrared radiation into the atmosphere. Greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).
Federally Enforceable means all limitations and conditions which are enforceable by the administrator including, but not limited to, the requirements of new source performance standards, national emission standards for hazardous air pollutants, state rules, administrative orders, construction permits, and operating permits.
Fugitive Emissions are emissions that cannot reasonably pass through a stack, chimney, duct, vent or other opening. Fugitive emission sources can include haul roads, exposed storage piles, and wastewater retention ponds, etc.
HAP or Hazardous Air Pollutants are any of the 187 pollutants listed in Section 112 of the 1990 Clean Air Act Amendments. HAPs are known or suspected of being toxic or carcinogenic.
Indirect Heating occurs when the material being heated does not come in direct contact with the combustion gas, such as a hot water boiler.
Iowacleanair.com is the web site for the DNR's air quality bureau with forms, assistance and guidance data.
MMcf equals 1,000,000 cubic feet. This unit of measure is most typically associated with the amount of natural gas combusted.
Material Balance or Mass Balance A process of estimating emissions using knowledge of the process, process rate, material used, and material properties.
Manually Operated Equipment means a machine or tool that is handheld, such as a handheld circular saw or compressed air chisel; a machine or tool for which the work piece is held or manipulated by hand, such as a bench grinder; a machine or tool for which the tool or bit is manipulated by hand, such as a lathe or drill press; any dust collection system which is part of such machine or tool; but not including any machine or tool for which the extent of manual operation is to control power to the machine or tool and not including any central dust collection system serving more than one machine or tool.
MACT or Maximum Achievable Control Technology are standards set under Title III of the 1990 Clean Air Act Amendments with an emphasis on technology control of hazardous air pollutants.
Maximum Hourly Design Rate is the highest amount of raw material processed or production achieved per hour based on manufacturer's data.

Maximum True Vapor Pressure means the equilibrium partial pressure of the material considering 1) for a material stored at ambient temperature, the maximum monthly average temperature as reported by the National Weather Service, or 2) for a material stored above or below the ambient temperature, the temperature equal to the highest calendar-month average of the material storage temperature.

Minor Source Emissions Inventory is the emissions inventory report that is due every third year for minor source facilities. Facilities which have the potential to emit of less than 100 tons/yr of an individual criteria air pollutant, less than 9.4 tons/yr of an individual hazardous air pollutant, and less than 24.4 tons/yr of total hazardous air pollutants are considered to be minor sources.

MSDS or Material Safety Data Sheets are an information source with details about chemical substances such as chemical composition and other environmental information. MSDS can be a useful source of emission information and are available for all chemical substances from the supplier of the material.

National Ambient Air Quality Standards (NAAQS) are the main ambient standards for the following six criteria pollutants: carbon monoxide, lead, nitrogen oxides, ozone, particulate matter within aerodynamic diameter less than or equal to 10 micrometers, and sulfur oxides.

National Emission Standards for Hazardous Air Pollutants (NESHAP) are health-based standards set under the 1970 Clean Air Act for beryllium, mercury, vinyl chloride, benzene, arsenic, asbestos, radon, radionuclides and other HAPs. Under the 1990 Act, roughly 170 source categories are identified for eventual MACT regulations. See MACT definition on page 65. The NESHAPs are published in 40 CFR Parts 61 and 63.

New Source Performance Standards (NSPS) are promulgated for criteria, hazardous, and other pollutant emissions from new, modified, or reconstructed sources that the U.S. EPA determines contribute significantly to air pollution. These are typically emission standards, but may be expressed in other forms such as concentration and opacity. The NSPS are published in 40 CFR Part 60.

Nitrogen Oxides (NOx) are a class of compounds that are respiratory irritants and that react with volatile organic compounds (VOC's) to form Ozone. NOx compounds are also precursors to acid rain. Motor vehicles, power plants, and other stationary combustion facilities emit large quantities of NOx.

Opacity means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background. Opacity can be measured by properly trained observers. The validity of such measurements has been well established in the courts, including the U.S. Supreme Court. DNR field inspectors often take opacity readings during inspections.

Operating Permits are permits required by Title V of the 1990 Act for major sources. Operating permits are for the facility as a whole and differ from construction permits, issued for individual pieces of equipment.

Overall Control Efficiency is obtained by multiplying the capture efficiency by the control equipment control efficiency to provide the overall control efficiency for reporting emissions.

Ozone (O3) is a colorless gas that damages lungs and can damage materials and vegetation. It is the primary constituent of smog, and is formed primarily when nitrogen oxides (NOx) and volatile organic compounds (VOCs) react in the presence of sunlight.

Particulate Matter of aerodynamic diameter less than or equal to 10 micrometers (PM10) is a measure of small solid matter suspended in the atmosphere. Small particles can penetrate deeply into the lung where they can cause respiratory problems. Emissions of PM-10 are significant from fugitive dust, power plants, commercial boilers, metallurgical industries, mineral industries, fires, and motor vehicles.

Particulate Matter of aerodynamic diameter less than or equal to 2.5 micrometers (PM2.5) is another measure of small solid matter suspended in the atmosphere. Primary PM-2.5 particulate results largely from combustion of fossil fuels or biomass, although selected industrial processes can also be significant in some areas. The sources of PM-2.5 include, but are not limited to, gasoline and diesel exhaust, wood stoves and fireplaces, land clearing, wildland prescribed burning, and wild fires. Sources of primary particulate including fugitive emissions from paved and unpaved roads, dust from ore processing and refining, and to a lesser extent, crustal material from construction activities, agricultural tilling, wind erosion and other crustal source are less important based on their relatively small contribution to ambient PM-2.5 concentrations. The condensable components are largely made up of semi-volatile organic compounds that condense at ambient temperature to form aerosol.

Potential to Emit (PTE) was devised by Congress as a "measuring-stick" to determine a uniform way to assess all types of facilities. Potential to emit is used to help determine what types of regulations apply to your facility. PTE is calculated assuming each emission unit operates continuously — 24 hours per day, 365 days per year at the maximum physical and operational design. Physical limitations on the equipment, pollution control equipment benefits, and federally enforceable permit limits can reduce PTE. For the purposes of calculating potential to emit for emergency generators, "maximum capacity" means one of the following:

1. 500 hours of operation annually, if the generator has actually been operated less than 500 hours per year for the past five years;
2. 8,760 hours of operation annually, if the generator has actually been operated more than 500 hours in one of the past five years; or
3. The number of hours specified in a state or federally enforceable limit.

Reported Emissions are those emission estimates that are submitted to a regulatory agency. Emission Inventories are used for a variety of purposes such as planning pollution control programs, promoting compliance with laws and regulations, and conducting permit reviews. Actual, potential and allowable emissions are typically reported.

Source Classification Codes (SCCs) are codes defined by EPA that classify air emission sources by individual processes and/or operations.

Stack Tests A test that measures the concentration of pollutants in the exhaust stack. Measurements are performed following procedures specified and developed by the US EPA and/or Iowa DNR. Such testing is required by DNR to be conducted by various stationary sources to determine compliance with applicable air emission limits.

SCFM Standard cubic feet per minute. A measurement of exhaust rate from an emission point.

Standard Industrial Classification (SIC) A United States government system for classifying industries by a four-digit code.

State Implementation Plan (SIP) is a state plan approved by EPA for the establishment, regulation, and enforcement of air pollution standards.

Stationary Source is any building, structure, facility or installation which emits or may emit any air pollutant subject to regulation under the Clean Air Act. It includes all pollutant emitting activities which belong in the same major industrial grouping as identified by the first two digits in the facilities SIC code, are located on one or more contiguous or adjacent properties and are under common ownership or control. Mobile sources such as cars, trains, and forklifts are not regulated by DNR.

Sulfur Oxides (SOx) are a class of colorless, pungent gases that are respiratory irritants and precursors to acid rain. Sulfur oxides are emitted from various combustion or incineration sources, particularly from coal combustion.

Tertiary-Butyl Acetate (TBAC) is a pollutant common to surface coating operations that is neither a VOC nor a HAP. However, EPA still requires that TBAC emissions be reported on the emissions inventory as an "additional pollutant".

Threshold is a level of emissions that once reached, triggers requirements to obtain a permit.

Transfer Efficiency is the percentage of sprayed material such as paint or solvent that is actually adhered to the intended surface.

Twelve-Month Rolling Period is a period of 12 consecutive months determined on a rolling basis.

Volatile Organic Compounds (VOCs) are organic compounds that contribute to ground-level ozone or smog formation. Ground level ozone is a strong lung oxidant. Large amounts of VOCs are emitted from fuel distribution, chemical manufacturing, motor vehicles, and a wide variety of industrial, commercial, and consumer solvent uses.

1000gal equals 1,000 gallons. This unit of measure is most typically associated with the amount of fuel oil or LPG combusted.

APPENDIX B

List of Criteria Pollutants, Chemicals Not Considered VOCs, and Hazardous Air Pollutants

Criteria Pollutants

$PM_{2.5}$	Particulate Matter less than or equal to 2.5 micrometers in diameter
PM_{10}	Particulate Matter less than or equal to 10 micrometers in diameter
SO_2	Sulfur Dioxide
NO_x	Nitrogen Oxides
VOC	Volatile Organic Compound
CO	Carbon Monoxide
Pb	Lead

Web Sites Listing VOCs

http://www.ene.gov.on.ca/envision/monitoring/VOC_List.htm
http://www.ene.gov.on.ca/envision/monitoring/VOC_List.pdf

Chemicals Not Considered Volatile Organic Compounds (VOCs) – from 40 CFR 51.100 (s):

(1) This includes any such organic compound other than the following, which have been determined to have negligible photochemical reactivity: methane; ethane; methylene chloride (dichloromethane); 1,1,1-trichloroethane (methyl chloroform); 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113); trichlorofluoromethane (CFC-11); dichlorodifluoromethane (CFC-12); chlorodifluoromethane (HCFC-22); trifluoromethane (HFC-23); 1,2-dichloro 1,1,2,2-tetrafluoroethane (CFC-114); chloropentafluoroethane (CFC-115); 1,1,1-trifluoro 2,2-dichloroethane (HCFC-123); 1,1,1,2-tetrafluoroethane (HFC-134a); 1,1-dichloro 1-fluoroethane (HCFC-141b); 1-chloro 1,1-difluoroethane (HCFC-142b); 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124); pentafluoroethane (HFC-125); 1,1,2,2-tetrafluoroethane (HFC-134); 1,1,1-trifluoroethane (HFC-143a); 1,1-difluoroethane (HFC-152a); parachlorobenzotrifluoride (PCBTF); cyclic, branched, or linear completely methylated siloxanes; acetone; perchloroethylene (tetrachloroethylene); 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca); 1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb); 1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC 43-10mee); difluoromethane (HFC-32); ethylfluoride (HFC-161); 1,1,1,3,3,3-hexafluoropropane (HFC-236fa); 1,1,2,2,3-pentafluoropropane (HFC-245ca); 1,1,2,3,3-pentafluoropropane (HFC-245ea); 1,1,1,2,3-pentafluoropropane (HFC-245eb); 1,1,1,3,3-pentafluoropropane (HFC-245fa); 1,1,1,2,3,3-hexafluoropropane (HFC-236ea); 1,1,1,3,3-pentafluorobutane (HFC-365mfc); chlorofluoromethane (HCFC-31); 1 chloro-1-fluoroethane (HCFC-151a); 1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a); 1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-butane ($C_4F_9OCH_3$; 2-difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane ($(CF_3)_2CFCF_2OCH_3$); 1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane ($C_4F_9OC_2H_5$); 2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane ($(CF_3)_2CFCF_2OC_2H_5$); methyl acetate and perfluorocarbon compounds which fall into these classes:

(i) Cyclic, branched, or linear, completely fluorinated alkanes;
(ii) Cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;
(iii) Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and
(iv) Sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

(5) The following compound(s) are VOC for purposes of all recordkeeping, emissions reporting, photochemical dispersion modeling and inventory requirements which apply to VOC and shall be uniquely identified in emission reports, but are not VOC for purposes of VOC emissions limitations or VOC content requirements: t-butyl acetate.

HFE-7300 was delisted January 18, 2007.

Hazardous Air Pollutants – alphabetical listing

Note: Methyl ethyl ketone (MEK) is no longer considered to be a HAP as of 12/19/05.

CAS Number	Chemical Name
A	
75-07-0	Acetaldehyde
60-35-5	Acetamide
75-05-8	Acetonitrile
98-86-2	Acetophenone
53-96-3	2-Acetylaminofluorene
107-02-8	Acrolein
79-06-1	Acrylamide
79-10-7	Acrylic acid
107-13-1	Acrylonitrile
107-05-1	Allyl chloride
92-67-1	4-Aminobiphenyl
62-53-3	Aniline
90-04-0	o-Anisidine
0	Antimony Compounds
0	Arsenic Compounds
1332-21-4	Asbestos (friable)
B	
71-43-2	Benzene
92-87-5	Benzidine
98-07-7	Benzoic trichloride
100-44-7	Benzyl chloride
0	Beryllium Compounds
92-52-4	Biphenyl
111-44-4	Bis(2-chloroethyl) ether
542-88-1	Bis(chloromethyl) ether
75-25-2	Bromoform
74-83-9	Bromomethane (Methyl Bromide)
106-99-0	1,3-Butadiene
106-88-7	1,2-Butylene oxide (1,2-Epoxybutane)
C	
0	Cadmium Compounds
156-62-7	Calcium cyanamide
133-06-2	Captan
63-25-2	Carbaryl
75-15-0	Carbon disulfide
56-23-5	Carbon tetrachloride
463-58-1	Carbonyl sulfide
120-80-9	Catechol
133-90-4	Chloramben
57-74-9	Chlordane
7782-50-5	Chlorine
79-11-8	Chloroacetic acid
532-27-4	2-Chloroacetophenone
108-90-7	Chlorobenzene
510-15-6	Chlorobenzilate
75-00-3	Chloroethane (Ethyl chloride)
67-66-3	Chloroform
74-87-3	Chloromethane (Methyl chloride)
107-30-2	Chloromethyl methyl ether
126-99-8	Chloroprene
0	Chromium Compounds
0	Cobalt Compounds
0	Coke Oven Emissions
1319-77-3	Cresol/Cresylic acid (isomers/mixtures)
108-39-4	m-Cresol
95-48-7	o-Cresol
106-44-5	p-Cresol
98-82-8	Cumene
0	Cyanide Compounds
D	
94-75-7	2,4-D, salts and esters
3547-04-4	DDE
117-81-7	Di(2-ethylhexyl) phthalate (DEHP)
334-88-3	Diazomethane
132-64-9	Dibenzofuran
96-12-8	1,2-Dibromo-3-chloropropane
106-93-4	1,2-Dibromoethane (Ethylene dibromide)
84-74-2	Dibutyl phthalate
106-46-7	1,4-Dichlorobenzene(p)
91-94-1	3,3'-Dichlorobenzidine
75-34-3	1,1-Dichloroethane (Ethylidene dichloride)
107-06-2	1,2-Dichloroethane (Ethylene dichloride)
75-09-2	Dichloromethane (Methylene chloride)
78-87-5	1,2-Dichloropropane (Propylene dichloride)
542-75-6	1,3-Dichloropropylene
62-73-7	Dichlorvos
111-42-2	Diethanolamine
121-69-7	N,N-Dimethylaniline
64-67-5	Diethyl sulfate
119-90-4	3,3'-Dimethoxybenzidine
60-11-7	4-Dimethylaminoazobenzene
119-93-7	3,3'-Dimethylbenzidine
68-12-2	Dimethyl formamide
57-14-7	1,1-Dimethyl hydrazine
131-11-3	Dimethyl phthalate
77-78-1	Dimethyl sulfate
79-44-7	Dimethylcarbamyl chloride
534-52-1	4,6-Dinitro-o-cresol
51-28-5	2,4-Dinitrophenol
121-14-2	2,4-Dinitrotoluene
123-91-1	1,4-Dioxane
122-66-7	1,2-Diphenylhydrazine
E	
106-89-8	Epichlorohydrin
140-88-5	Ethyl acrylate
100-41-4	Ethylbenzene
107-21-1	Ethylene glycol
75-21-8	Ethylene oxide
96-45-7	Ethylene thiourea
151-56-4	Ethyleneimine
F	
0	Fine Mineral Fibers
50-00-0	Formaldehyde
G	
	Glycol Ethers (See page 72)

CAS Number	Chemical Name
H	
76-44-8	Heptachlor
87-68-3	Hexachloro-1,3-butadiene
118-74-1	Hexachlorobenzene
77-47-4	Hexachlorocyclopentadiene
67-72-1	Hexachloroethane
822-06-0	Hexamethylene-1,6-diisocyanate
680-31-9	Hexamethylphosphoramide
110-54-3	Hexane
302-01-2	Hydrazine
7647-01-0	Hydrochloric acid
7664-39-3	Hydrogen fluoride
123-31-9	Hydroquinone
I	
78-59-1	Isophorone
L	
0	Lead Compounds
58-89-9	Lindane
M	
108-31-6	Maleic anhydride
0	Manganese Compounds
0	Mercury Compounds
67-56-1	Methanol
72-43-5	Methoxychlor
60-34-4	Methyl hydrazine
74-88-4	Methyl iodide
108-10-1	Methyl isobutyl ketone
624-83-9	Methyl isocyanate
80-62-6	Methyl methacrylate
1634-04-4	Methyl tert-butyl ether
101-14-4	4,4'-Methylenebis(2-chloroaniline)
101-68-8	Methylenebis(phenylisocyanate)
101-77-9	4,4'-Methylenedianiline
N	
91-20-3	Naphthalene
0	Nickel Compounds
98-95-3	Nitrobenzene
92-93-3	4-Nitrobiphenyl
100-02-7	4-Nitrophenol
79-46-9	2-Nitropropane
62-75-9	N-Nitrosodimethylamine
59-89-2	N-Nitrosomorpholine
684-93-5	N-Nitroso-N-methylurea
P	
56-38-2	Parathion
87-86-5	Pentachlorophenol
108-95-2	Phenol
106-50-3	p-Phenylenediamine
75-44-5	Phosgene
7803-51-2	Phosphine
7723-14-0	Phosphorus (yellow or white)
85-44-9	Phthalic anhydride

CAS Number	Chemical Name
85-44-9	Phthalic anhydride
1336-36-3	Polychlorinated biphenyls
0	Polycyclic Organic Matter
1120-71-4	Propane sultone
123-38-6	Propionaldehyde
57-57-8	beta-Propiolactone
114-26-1	Propoxur
75-56-9	Propylene oxide
75-55-8	Propyleneimine
Q	
91-22-5	Quinoline
106-51-4	Quinone
82-68-8	Quintozene
R	
0	Radionuclides (including Radon)
S	
0	Selenium Compounds
100-42-5	Styrene
96-09-3	Styrene oxide
T	
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
79-34-5	1,1,2,2-Tetrachloroethane
127-18-4	Tetrachloroethylene
7550-45-0	Titanium tetrachloride
108-88-3	Toluene
95-80-7	2,4-Toluene diamine (2,4-Diaminotoluene)
584-84-9	2,4-Toluene diisocyanate
95-53-4	o-Toluidine
800-135-2	Toxaphene
120-82-1	1,2,4-Trichlorobenzene
71-55-6	1,1,1-Trichloroethane
79-00-5	1,1,2-Trichloroethane
79-01-6	Trichloroethylene
95-95-4	2,4,5-Trichlorophenol
88-06-2	2,4,6-Trichlorophenol
121-44-8	Triethylamine
1582-09-8	Trifluralin
540-84-1	2,2,4-Trimethylpentane
U	
51-79-6	Urethane
V	
108-05-4	Vinyl acetate
593-60-2	Vinyl bromide
75-01-4	Vinyl chloride
75-35-4	Vinylidene chloride
X	
1330-20-7	Xylene (mixed isomers)
108-38-3	m-Xylene
95-47-6	o-Xylene
106-42-3	p-Xylene

Hazardous Air Pollutants - by CAS Number

Note: Methyl ethyl ketone (MEK) is no longer considered to be a HAP as of 12/19/05.

CAS Number	Chemical Name
0	Antimony Compounds
0	Arsenic Compounds
0	Beryllium Compounds
0	Cadmium Compounds
0	Chromium Compounds
0	Cobalt Compounds
0	Coke Oven Emissions
0	Cyanide Compounds
0	Fine Mineral Fibers
0	Glycol Ethers (See page 72)
0	Lead Compounds
0	Manganese Compounds
0	Mercury Compounds
0	Nickel Compounds
0	Polycyclic Organic Matter
0	Radionuclides (including Radon)
0	Selenium Compounds
50-00-0	Formaldehyde
51-28-5	2,4-Dinitrophenol
51-79-6	Urethane
53-96-3	2-Acetylaminofluorene
56-23-5	Carbon tetrachloride
56-38-2	Parathion
57-14-7	1,1-Dimethyl hydrazine
57-57-8	beta-Propiolactone
57-74-9	Chlordane
58-89-9	Lindane
59-89-2	N-Nitrosomorpholine
60-11-7	4-Dimethylaminoazobenzene
60-34-4	Methyl hydrazine
60-35-5	Acetamide
62-53-3	Aniline
62-73-7	Dichlorvos
62-75-9	N-Nitrosodimethylamine
63-25-2	Carbaryl
64-67-5	Diethyl sulfate
67-56-1	Methanol
67-66-3	Chloroform
67-72-1	Hexachloroethane
68-12-2	Dimethyl formamide
71-43-2	Benzene
71-55-6	1,1,1-Trichloroethane
72-43-5	Methoxychlor
74-83-9	Bromomethane (Methyl Bromide)
74-87-3	Chloromethane (Methyl chloride)
74-88-4	Methyl iodide
75-00-3	Chloroethane (Ethyl chloride)
75-01-4	Vinyl chloride
75-05-8	Acetonitrile
75-07-0	Acetaldehyde
75-09-2	Dichloromethane (Methylene chloride)
75-15-0	Carbon disulfide
75-21-8	Ethylene oxide
75-25-2	Bromoform
75-34-3	1,1-Dichloroethane (Ethylidene dichloride)
75-35-4	Vinylidene chloride
75-44-5	Phosgene
75-55-8	Propyleneimine
75-56-9	Propylene oxide
76-44-8	Heptachlor
77-47-4	Hexachlorocyclopentadiene
77-78-1	Dimethyl sulfate
78-59-1	Isophorone
78-87-5	1,2-Dichloropropane (Propylene dichloride)
79-00-5	1,1,2-Trichloroethane
79-01-6	Trichloroethylene
79-06-1	Acrylamide
79-10-7	Acrylic acid
79-11-8	Chloroacetic acid
79-34-5	1,1,2,2-Tetrachloroethane
79-44-7	Dimethylcarbamyl chloride
79-46-9	2-Nitropropane
80-62-6	Methyl methacrylate
82-68-8	Quintozene
84-74-2	Dibutyl phthalate
85-44-9	Phthalic anhydride
87-68-3	Hexachloro-1,3-butadiene
87-86-5	Pentachlorophenol
88-06-2	2,4,6-Trichlorophenol
90-04-0	o-Anisidine
91-20-3	Naphthalene
91-22-5	Quinoline
91-94-1	3,3'-Dichlorobenzidine
92-52-4	Biphenyl
92-67-1	4-Aminobiphenyl
92-87-5	Benzidine
92-93-3	4-Nitrobiphenyl
94-75-7	2,4-D, salts and esters
95-47-6	o-Xylene
95-48-7	o-Cresol
95-53-4	o-Toluidine
95-80-7	2,4-Toluene diamine (2,4-Diaminotoluene)
95-95-4	2,4,5-Trichlorophenol
96-09-3	Styrene oxide
96-12-8	1,2-Dibromo-3-chloropropane
96-45-7	Ethylene thiourea
98-07-7	Benzoic trichloride
98-82-8	Cumene
98-86-2	Acetophenone
98-95-3	Nitrobenzene
100-02-7	4-Nitrophenol
100-41-4	Ethylbenzene
100-42-5	Styrene
100-44-7	Benzyl chloride
101-14-4	4,4'-Methylenebis(2-chloroaniline)
101-68-8	Methylenebis(phenylisocyanate)
101-77-9	4,4'-Methylenedianiline
106-42-3	p-Xylene
106-44-5	p-Cresol
106-46-7	1,4-Dichlorobenzene(p)
106-50-3	p-Phenylenediamine
106-51-4	Quinone
106-88-7	1,2-Butylene oxide (1,2-Epoxybutane)
106-89-8	Epichlorohydrin
106-93-4	1,2-Dibromoethane (Ethylene dibromide)
106-99-0	1,3-Butadiene
107-02-8	Acrolein
107-05-1	Allyl chloride
107-06-2	1,2-Dichloroethane (Ethylene dichloride)
107-13-1	Acrylonitrile
107-21-1	Ethylene glycol
107-30-2	Chloromethyl methyl ether
108-05-4	Vinyl acetate
108-10-1	Methyl isobutyl ketone
108-31-6	Maleic anhydride
108-38-3	m-Xylene

CAS Number	Chemical Name
108-39-4	m-Cresol
108-88-3	Toluene
108-90-7	Chlorobenzene
108-95-2	Phenol
110-54-3	Hexane
111-42-2	Diethanolamine
111-44-4	Bis(2-chloroethyl) ether
114-26-1	Propoxur
117-81-7	Di(2-ethylhexyl) phthalate (DEHP)
118-74-1	Hexachlorobenzene
119-90-4	3,3'-Dimethoxybenzidine
119-93-7	3,3'-Dimethylbenzidine
120-80-9	Catechol
120-82-1	1,2,4-Trichlorobenzene
121-14-2	2,4-Dinitrotoluene
121-44-8	Triethylamine
121-69-7	N,N-Dimethylaniline
122-66-7	1,2-Diphenylhydrazine
123-31-9	Hydroquinone
123-38-6	Propionaldehyde
123-91-1	1,4-Dioxane
126-99-8	Chloroprene
127-18-4	Tetrachloroethylene
131-11-3	Dimethyl phthalate
132-64-9	Dibenzofuran
133-06-2	Captan
133-90-4	Chloramben
140-88-5	Ethyl acrylate
151-56-4	Ethyleneimine
156-62-7	Calcium cyanamide
302-01-2	Hydrazine
334-88-3	Diazomethane
463-58-1	Carbonyl sulfide
510-15-6	Chlorobenzilate
532-27-4	2-Chloroacetophenone
534-52-1	4,6-Dinitro-o-cresol
540-84-1	2,2,4-Trimethylpentane
542-75-6	1,3-Dichloropropylene
542-88-1	Bis(chloromethyl) ether
584-84-9	2,4-Toluene diisocyanate
593-60-2	Vinyl bromide
624-83-9	Methyl isocyanate
680-31-9	Hexamethylphosphoramide
684-93-5	N-Nitroso-N-methylurea
822-06-0	Hexamethylene-1,6-diisocyanate
1120-71-4	Propane sultone
1319-77-3	Cresol/Cresylic acid (isomers and mixture)
1330-20-7	Xylene (mixed isomers)
1332-21-4	Asbestos (friable)
1336-36-3	Polychlorinated biphenyls
1582-09-8	Trifluralin
1634-04-4	Methyl tert-butyl ether
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
3547-04-4	DDE
7550-45-0	Titanium tetrachloride
7647-01-0	Hydrochloric acid
7664-39-3	Hydrogen fluoride
7723-14-0	Phosphorus (yellow or white)
7782-50-5	Chlorine
7803-51-2	Phosphine
8001-35-2	Toxaphene

Glycol Ethers*

Chemical Name	CAS Number
Diethylene glycol dimethyl ether	111-96-6
Diethylene glycol monobutyl ether acetate	124-17-4
Diethylene glycol monobutyl ether	112-34-5
Diethylene glycol monoethyl ether acetate	112-15-2
Diethylene glycol monoethyl ether	111-90-0
Diethylene glycol monohexyl ether	112-59-4
Diethylene glycol monomethyl ether acetate	629-38-9
Diethylene glycol monomethyl ether	111-77-3
Ethylene glycol dibutyl ether	112-48-1
Ethylene glycol diethyl ether	629-14-1
Ethylene glycol dimethyl ether	110-71-4
Ethylene glycol monoacetate	542-59-6
Ethylene glycol monobutyl ether acetate	112-07-2
Ethylene glycol monoethyl ether acetate	111-15-9
Ethylene glycol monoethyl ether	110-80-5
Ethylene glycol monohexyl ether	112-25-4
Ethylene glycol monomethyl ether acetate	110-49-6
Ethylene glycol monomethyl ether	109-86-4
Ethylene glycol monooctyl ether	10020-43-6
Ethylene glycol monophenyl ether	122-99-6
Ethylene glycol monopropyl ether	2807-30-9
Triethylene glycol	112-27-6
Triethylene glycol dimethyl ether	112-49-2
Triethylene glycol monoethyl ether	112-50-5
Triethylene glycol monomethyl ether	112-35-6

*This is a partial list of common glycol ethers. A complete listing can be found on line at **http://www.iowadnr.com/air/prof/oper/tech/glycolethers.pdf**

APPENDIX C
Iowa DNR Control Efficiency Guidance

Details
The level of air emissions from a facility depends on many factors. For many industrial processes, technical information is available to assist in determining the quantity and types of air pollutants that a process would create and thus be emitted without any control. This information on the quantity of air pollutants generated during a particular process is referred to as an emission factor. Facilities can control the amount of pollutants emitted to the atmosphere from these processes by installing air pollution control equipment. The level of control depends on various factors. These include: the type of equipment used; the design of the equipment; the process involved; temperature; air flow rates; raw materials; combustion products, etc.; as well as the pollutant(s) targeted for control. Control efficiency is contaminant specific.

DNR staff has prepared a general guidance document identifying typical control efficiencies achieved by different generic types of control equipment. The control efficiency values identified in the table represent single pieces of control equipment. Multiple pieces of control equipment in series should be evaluated on a case-by-case basis.

This control efficiency guidance document is used in reviewing emission inventories by comparing the facility's claimed control efficiency with the guidance document's value. If the facility claims higher control efficiency for a particular piece of equipment, DNR staff will request supporting information to substantiate the facility's claim. This supporting information would consist of test results either from a previous stack test, continuous emission monitoring, or any other verifiable source of information.

With regards to control efficiencies for $PM_{2.5}$, currently there are no approved $PM_{2.5}$ test methods. The $PM_{2.5}$ control efficiency is currently assumed to be equal to the PM_{10} control efficiency due to a lack of documentation. If a facility has any questions regarding $PM_{2.5}$ control efficiency, please call the emissions inventory staff.

Control Efficiency Table

Control Device or Practice	Control Efficiency (%)						
	TSP	PM_{10}	SOx	NOx	VOC	CO	Pb
Wet Scrubber - high efficiency	note 1		note 2				
Wet Scrubber - med efficiency	note 1		note 2				
Wet Scrubber - low efficiency	note 1		note 2				
Gravity Collector	3[a]	--	--	--	--	--	2[a]
Centrifugal Collector (cyclone)-high efficiency*	95[c]	80[a]	--	--	--	--	65[a]
Centrifugal Collector (cyclone)-med efficiency*	75[c]	50[a]	--	--	--	--	40[a]
Centrifugal Collector (cyclone)-low efficiency*	35[c]	10[a]	--	--	--	--	8[a]
Electrostatic Precipitator-high efficiency**	95[a]	95[a]	--	--	--	--	75[a]
Electrostatic Precipitator-medium efficiency**	80[a]	80[a]	--	--	--	--	65[a]
Electrostatic Precipitator-low efficiency**	70[a]	70[a]	--	--	--	--	55[a]
Fabric Filter	99[a]	95[c]	--	--	--	--	80[a]
Catalytic Afterburner	--	--	--	--	95[c]	--	--
Direct Flame Afterburner	--	--	--	--	95[c]	--	--
Flaring	--	--	--	--	90[a]	--	--
Low NOx Burners	--	--	--	note 3	--	--	--
Staged Combustion	--	--	--	40[a]	--	--	--
Flue Gas Recirculation	--	--	--	50[a]	--	--	--
Reduced Combustion Air Preheat	--	--	--	note 4	--	--	--
Steam or Water Injection	--	--	--	65[a]	--	--	--
Low Excess Air Firing	--	--	--	30[a]	--	--	--
Fuel with low Nitrogen Content	--	--	--	50[a]	--	--	--
Sulfuric Acid Plant-Single Contact Process	--	--	50[a]	--	--	--	--
Sulfuric Acid Plant-Double Contact Process	--	--	95[a]	--	--	--	--
Vapor Recovery System (Condensers)	--	--	--	--	note 5	--	--
Activated Carbon Adsorption	--	--	note 6				--
Gas Absorption Column-packed	90[a]	90[a]	note 2				--
Gas Absorption Column-tray type	25[a]	25[a]	note 2				--
Spray Tower	20[a]	20[a]	note 2				--
Venturi Scrubber	90[a]	90[a]	note 2				--

Control Efficiency Table (continued)

Control Device or Practice	Control Efficiency (%)						
	TSP	PM_{10}	SOx	NOx	VOC	CO	Pb
Impingement Plate Scrubber	note 7		--	--	--	--	--
Mat or Panel Filter	90 [c]	90 [c]	--	--	--	--	--
Dust Suppression by Water Spray	40 [a]	40 [a,d]	--	--	--	--	--
Dust Suppression by Chemical or Wetting Agents	40 [a]	40 [a,d]	--	--	--	--	--
Catalytic Reduction	--	--	--	note 8	--	--	--
Wet Lime Slurry Scrubbing	--	--	85 [c]	--	--	--	--
Multiple Cyclone w/o Fly Ash Reinjection	80 [a]	80 [a]	--	--	--	--	65 [a]
Multiple Cyclone with Fly Ash Reinjection	50 [a]	50 [a]	--	--	--	--	40 [a]
Water Curtain	50 [c]	10 [a]	--	--	--	--	--

[a] – Control efficiency was taken from a literature review and developmental work by the Minnesota Pollution Control Agency
[b] – Control efficiency was taken from AP-42
[c] – Control efficiency was developed from the combination of a literature review and developmental work by the Minnesota Pollution Control Agency, AP-42, and staff judgment
[d] – Unless a higher efficiency is required as an operating condition of a DNR construction permit

***** Low, medium, and high efficiency cyclones will be defined based on pressure drop. The ranges of pressure drops are as follows:

Low-efficiency cyclones	2-4 inches water
Medium-efficiency cyclones	4-7 inches water
High-efficiency cyclones	7-10 inches water

****** Low, medium, and high efficiency electrostatic precipitators (ESP) will be defined based on the specific collection area (SCA). The SCA is the total collector plate area divided by the gas volume flow rate. It is usually expressed in terms of square feet per 1000 acfm of gas flow. For example, the SCA of an ESP with a gas flow rate of 250,000 acfm and collection plate area of 100,000 square feet is:

$$100{,}000\ ft^2\ /\ 250{,}000\ acfm \times 0.001\ =\ 400\ ft^2/thousand\ acfm$$

The ranges of SCA for low, medium, and high efficiency ESPs are as follows:

Low-efficiency ESP	< 400
Medium-efficiency ESP	400 - 700
High-efficiency ESP	> 700

Typical control efficiencies were not assigned to all control devices because some efficiencies strongly depend on source specific parameters. In these instances the table will refer to one of the notes listed below for additional information.

Note 1. Particulate control equipment represented by these classifications should be included in the other, more specific categories (i.e., venturi scrubbers or packed bed absorption columns).

Note 2. The achievable gaseous pollutant control efficiencies for these types of control equipment will depend on the pollutant solubility, the solvent used, the vapor-liquid contact time, and the contact area. These devices are normally designed to achieve a promulgated control efficiency rather than the maximum achievable reduction. Control efficiencies for these devices should be evaluated on a case-by-case basis.

Note 3. Low NOx burners (LNB) have been developed by many boiler and burner manufacturers for both new and retrofit applications. Low NOx burners limit NOx formation by controlling both the stoichiometric and temperature profiles of the combustion process. This control is achieved with design features that regulate the aerodynamic distribution and mixing of the fuel and air, yielding one or more of the following conditions:

1. Reduced O_2 in the primary combustion zone, which limits fuel NOx formation;
2. Reduced flame temperature, which limits thermal NOx formation; and
3. Reduced residence time at peak temperature, which limits thermal NOx formation.

The amount of NOx reduction achievable is dependent upon the combustion system and burner design, actual operating practices, and fuel characteristics. The amount of reduction should be based on the manufacturer's demonstration.

Note 4. The amount of NOx reduction achievable from reducing preheating of combustion air will vary according to the temperatures before and after the modification. Therefore, efficiencies for this process should be evaluated on a case-by-case basis.

Note 5. Control efficiencies for a particular condenser will vary for different VOC compounds and depends on both the partial pressure of the pollutant and the operating parameters of the condenser. Efficiencies should be evaluated on a case-by-case basis.

Note 6. Since the overall control efficiency will depend on source specific parameters such as the physical characteristics of the absorbent bed and gaseous stream, the temperature, and the choice of regeneration technique, efficiencies should be evaluated on a case-by-case basis.

Note 7. Depending on the application control efficiencies may range from 25-99%. Efficiencies should be evaluated on a case-by-case basis.

Note 8. Generic classification; recommend specific technologies be addressed on an individual basis. Two widely used NOx control technologies include Selective Catalytic Reduction (SCR) and Selective Noncatalytic Reduction (SNCR). SCR can obtain reductions of 60-90%. Urea based SNCR can achieve reductions of 30-80% and ammonia based 55-85%.

APPENDIX D

Abbreviations, Conversion Factors, and Spray Painting Transfer Efficiencies

Abbreviations

ACFM	Actual cubic feet per minute
CAA	Clean Air Act
CAS	Chemical Abstract Service Registry number
CFR	Code of Federal Regulation
CHIEF	The Clearinghouse for Inventories and Emission Factors
CO	Carbon Monoxide
DNR	Iowa Department of Natural Resources
EIQ	Emission Inventory Questionnaire
GHG	Greenhouse Gas
gr./dscf	grains per dry standard cubic foot
HAP	Hazardous Air Pollutant
IAC	Iowa Administrative Code
lbs/hr	pounds per hour
lbs/MMBtu	pounds per million British thermal units
lbs/MMcf	pounds per million cubic feet
MACT	Maximum Achievable Control Technology
MSDS	Material Safety Data Sheet
MSEI	Minor Source Emission Inventory
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_x	Nitrogen Oxides
NSPS	New Source Performance Standards
NSR	New Source Review
˚F	degrees Fahrenheit
PM_{10}	Particulate Matter less than or equal to 10 micrometers in diameter
$PM_{2.5}$	Particulate Matter less than or equal to 2.5 micrometers in diameter
ppmv	parts per million by volume
PTE	Potential to Emit
SCC	Source Classification Code
SCFM	Standard cubic feet per minute
SIC	Standard Industrial Classification
SO_2	Sulfur Dioxide
SPARS	State Permitting and Air Reporting System
TPY	Tons per year
TSP	Total Suspended Particulates
USEPA	United States Environmental Protection Agency
VOC's	Volatile Organic Compounds

Conversion Factors*

**Additional conversion factors are located in AP-42, Appendix A.*

- 1,050 Btu per ft^3 (Natural Gas)
- .0905 MMBtu per gallon (Propane)
- .140 MMBtu per gallon (No.2 Fuel Oil)
- .140 MMBtu per gallon (Diesel Fuel)
- 1 pound is equal to 7,000 grains
- 1 ton is equal to 2,000 pounds
- 1 gallon is equal to 3.785 liters
- 1 gallon of water is equal to 8.345 pounds

- To convert ounces into pounds multiply by 0.0625
- 56 pounds per bushel (corn)
- 60 pounds per bushel (soybeans)
- To convert g/L to lbs/gal:
  lbs/gal = (g/L) x .008345
- To convert scfm to acfm at standard pressure:
  $\text{Acfm} = \frac{\text{(actual temp. (˚F) + 460)}}{\text{(standard temp. (˚F) + 460)}} \times \text{scfm}$
- standard temperature = 70 ˚F

Spray Painting Transfer Efficiencies

Transfer Efficiency as a function of Spraying Method and Sprayed

Method of Spraying	Flat Surface (%)	Table Leg Surface (%)	Bird Case Surface (%)
Air atomized	50	15	10
Airless	75-80	10	10
Electrostatic:			
Disk	95	90-65	90-95
Airless	80	70	70
Air atomized	75	65	65

Source: Adapted from Air Pollution Engineering Manual, Table 2, pg. 36

APPENDIX E

Minor Source Emissions Inventory Completeness Checklist

MSEI Completeness Checklist

Have you included . . .

Form INV-1 Facility Identification

☑ Your facility contact person's address and phone number
☑ Your facility latitude and longitude

Form INV-2 Emission Point Description

☑ Emission Point Forms for all emission units

Form INV-3 Emission Unit Description – Potential Emissions

☑ SCC numbers for all emission units, if available
☑ Dates of construction and installation
☑ Federally enforceable limits in calculations where applicable
☑ Your emission units' maximum design rates
☑ Multiple forms if more than one process is possible
☑ **PM-2.5 and Ammonia estimates where applicable**

Form INV-4 Emission Unit Description – Actual Emissions

☑ The actual throughput for each emission unit
☑ The actual operating schedule
☑ Multiple forms if more than one process
☑ **PM-2.5 and Ammonia emissions where applicable**

Form INV-5 Calculations

☑ All material safety data sheets, if applicable
☑ For paint booths, a list containing the amount of each paint and solvent used
☑ All calculations shown in full, including engineering estimates

Other Reminders

☑ Are your control efficiencies acceptable according to the control efficiency guidance document?
☑ Did you use the most recent emission factors available?